INSTITUTO
UNIVERSITÁRIO
DE LISBOA

UNIVERSITÀ
DEGLI STUDI
DI PALERMO

How sustainability drives new venture investments: The moderating effect of Upstream Support policies

Elisa Lo Bue

Master in Management of Services and Technology

Supervisor:
Professor Giovanni Perrone, Ordinary,
Università degli studi di Palermo

10, 2023

Department of Marketing, Strategy and Operations

How sustainability drives new venture investments: The moderating effect of Upstream Support policies

Elisa Lo Bue

Master in Management of Services and Technology

Supervisor:

Professor Giovanni Perrone, Ordinary,
Università degli studi di Palermo

10, 2023

Resumo

A investigação proposta nesta tese tem como objetivo investigar em que medida a sustentabilidade (Q56) actua como catalisador nas decisões de investimento de três categorias principais de investidores de capital de risco (VC): Independent Venture Capital, Corporate Venture Capital e Government Venture Capital (G24). Ao mesmo tempo,pretende-se avaliar a eficácia das políticas de incentivo propostas pela OCDE, com enfoque no Índice EPS, que promovem e apoiam este tipo de investimentos sustentáveis. Mais especificamente, esta tese analisa as políticas de apoio a montante, que lidam com as despesas de I&D. A literatura investiga o campo florescente das startups sustentáveis, fornece uma visão abrangente dos investimentos em Independent Venture Capital, Corporate Venture Capital e Government Venture Capital, discute também a história da OCDE e, posteriormente, investiga o índice EPS. Para analisar empiricamente o quadro teórico, foi criado um conjunto de dados ad-hoc que reúne dados de várias fontes. O conjunto de dados consistiu em 722 observações, 368 startups, uma série temporal considerando investimentos de 2010 a 2022, 3 variáveis dependentes (nIndependent Venture Capital, nCorporate Venture Capital e nGovernment Venture Capital), uma variável independente (SUST), uma variável de moderação (Up-stream Suppot) e 17 variáveis de controlo. O softwareSTATA foi utilizado para analisar este painel de dados, para as três regressões foi utilizado o comando nbreg. Foram feitos três tipos de regressões para cada variável dependente, uma considerando apenas as variáveis de controlo, outra considerando as variáveis de controlo e a variável sustentabilidade, e uma regressão final considerando o produto entre a variável sustentabilidade e a variável padronizada Upstream Support.

Keywords: Venture Capital, Environment and Development, Environment and Growth, Environmental Equity, Sustainability

JEL Classification: Q56, G24

Abstract

The research proposed in this thesis aims to investigate the extent to which sustainability (Q56) acts as a catalyst in the investment decisions of three main categories of Venture Capital (VC) investors: Independent Venture Capital, Corporate Venture Capital and Government Venture Capital (G24). At the same time, it aims to assess the effectiveness of incentive policies proposed by the OECD, with a focus on the EPS Index, which promotes andsupports this type of sustainable investments. More specifically, this thesis analyzes the Up- stream Support policies, which deal with R&D Expenditure. The literature investigates the burgeoning field of sustainable startups, provides a comprehensive overview of Independent Venture Capital, Corporate Venture Capital and Government Venture Capital investments, also discusses the history of the OECD, subsequently investigating the EPS index. To empirically analyze the theoretical framework an ad-hoc dataset it was built gather-ing data from several sources. The dataest consisted of 722 observations, 368 startups, a time series considering investments from 2010 to 2022, 3 dependent variables (nIndependent Venture Capital, nCorporate Venture Capital, and nGovernment Venture Capital), one independent variable (SUST), one moderation variable (Upstream Suppot), and 17control variables. STATA software was used to analyze this panel of data, for all three regres- sions the nbreg command was used. Three types of regressions were made for each dependentvariable, one considering only the control variables, another considering the control variables and the sustainability variable, and a final regression considering the product between the sus- tainability variable and the standardized Upstream Support variable.

Keywords: Venture Capital, Environment and Development, Environment and Growth, Environmental Equity, Sustainability

JEL Classification: Q56, G24

INDEX

INDEX OF FIGURES

CONTENTS OF TABLES

GLOSSARY

UNFCCC - United Nations Framework Convention on Climate Change

M&A – Merger and acquisition

IVC – Independent venture capital

CVC – Corporate venture capital

GVC – Government venture capital

EPS – Environmental Policy Stringency index

OECD - Organization for Economic Cooperation and Development

CoPs - Conferences of the Parties

VC – Venture capital

Nox - Nitrogen Oxides

Tax Sox - Sulphur Oxides Tax

ELV - Emission Limit Value

IPO - Initial Public Offering

SUST – Sustainability

US – United States

1. INTRODUCTION

The acknowledgment of the planet's finite resources, as well as the necessity to combat climate change, has expedited the 21st century's transition toward sustainability. At the same time, the startup scene has altered, with a rising number of entrepreneurs concentrating their efforts on finding solutions that balance commercial success with environmental responsibility. At the crossroads of innovation and sustainability, these sustainable businesses provide creative ideas to addressing issues ranging from renewable energy adoption and circular economy practices to affordable healthcare and ethical purchasing (Ciulli et al., 2022).

The term "sustainability" has several connotations and has acquired prominence since the United Nations Brundtland Commission Report in 1987, connect economic growth to environmental well-being. The term "sustainable development" refers to development that satisfies current requirements without jeopardizing future generations. It has since become a fundamental part of human efforts to preserve resources, maintain ecological balance and improve quality of life (Sustainability – statistics & facts, 2023).

Economic expansion has harmed the environment since the Industrial Revolution, causing Earth Overshoot Day to be predicted every decade owing to excessive resource use. The Earth's finite resources will be insufficient to support the economy and the expanding population, which is estimated to reach 10 billion by 2060. We can see in the Figure 1.1 how many Earths would be needed if the population of the world lived like the population of a specific country (Sustainability – statistics & facts, 2023). To address this predicament, sustainability plans seek to strike a balance between economic advancement and resource protection.

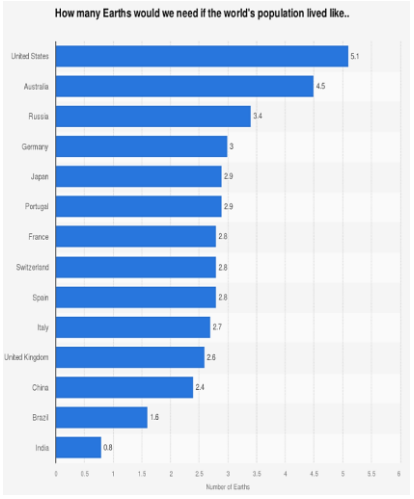


Figure 1.1: How many Earths would we needif the world's population lived like..

Source: Statista, Sustainability - statistics &facts, Published by Bruna Alves, Jun 29 2023

The United Nations 2030 Agenda for Sustainable Development, which was approved in 2015, has 17 objectives aimed at addressing global concerns and promoting a more

sustainable future. Various players, including ESG investments, contribute to the attainment of these aims.

Governments have established financial mechanisms such as green bonds to encourage long-term investments in environmentally friendly initiatives. Sustainability plans link profits to environmentally friendly practices across the value chain, addressing issues such as packaging. From Figure 1.2 we can see the sharp increase in companies reporting on sustainability worldwide, especially from 2002 to 2011 (Sustainability – statistics & facts, 2023).

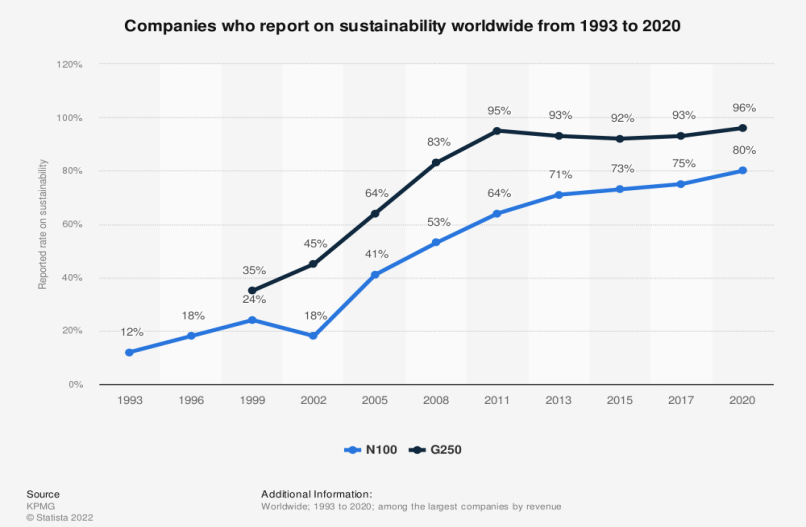


Figure 1.2: Companies who report on sustainability worldwide from 1993 to 2020

Source: Statista, Sustainability - statistics & facts, Published by Bruna Alves, Jun 29 2023

However, the road to turning unique ideas into sustainable, influential enterprises is fraught with difficulties. Funding, in particular, stands out as a constant impediment that may either push or inhibit entrepreneurs' growth. This is when venture investors come into play. Venture capital is the lifeblood that keeps entrepreneurs, emerging companies and startups growing by injecting financial resources, industry experience, and important networks. The engagement of venture capitalists becomes even more crucial in the case of sustainable businesses, since their backing not only accelerates growth but also verifies the feasibility of ecologically responsible business models (DiVito & Ingen-Housz, 2021).

The venture capital environment, on the other hand, is diversified, including independent venture capitalists, corporate venture capitalists, and government venture capitalists. Each group has its own set of incentives, resources, and expectations. Independent venture capitalists seek financial rewards as well as the potential for disruptive innovation. Corporate venture capitalists tap on the resources of their parent company to acquire strategic insights and drive technology adoption. Government venture capitalists prefer firms that are aligned with national aims and social well-being (Lin, 2022).

The Organization for Economic Cooperation and Development (OECD) plays a crucial role in shaping the international investment environment through the promotion of policies and recommendations. OECD policies often aim to create incentives for sustainable investment, promoting transparency, corporate accountability and the adoption of sustainable business practices (Bianchini & Croce, 2022).

In this context, the sperimental research proposed in this thesis aims to investigate the extent to which sustainability acts as a catalyst in investment decisions of three main categories of investors: Independent Venture Capital, Corporate Venture Capital and Governament Venture Capital. At the same time, it aims to evaluate the effectiveness of the incentive policies proposed by the Organization for Economic Cooperation and Development (OECD), with particular attention to the Environmental Policy Stringency (EPS)Index and the Upstream Support Index, promoting and supporting this type of sustainable investment.

This investigation is crucial for various reasons:

- Sustainability as a Global Priority: The globe is confronted with global concerns such as climate change, biodiversity loss, and natural resource depletion. Sustainability has emerged as a worldwide issue, as evidenced by programs such as the United Nations Sustainable Development Goals and international treaties such as the Paris Agreement. This study will aid in understanding how venture capital investments may support these goals.
- Europe's Role in Sustainability: The European Union has launched an extensive sustainability program, including the European Green Deal and the Recovery and Resilience Plan. Research might aid in understanding how venture capital investments can be matched with these initiatives and promote the transition to a greener economy.
- COP and International accords: The Conferences of the Parties (COP) and international climate accords have made obvious the necessity for significant investment in sustainable technology and innovation. This information can help venture capital investors contribute to global efforts to solve climate and environmental concerns.
- Incentives and Public Policies: OECD policies may have a considerable influence on investment decisions. This research can assist to analyze the efficacy of these policies in steering investment toward sustainable projects and provide recommendations to enhance them.

2. LITERATURE REVIEW

After explaining and clarifying the research objective, the next step will be to conduct a systematic review of the published literature on the topic in order to develop a theoretical framework that will guide us in conducting the empirical analysis.

This literature review aims to investigate the burgeoning field of sustainable start-ups. The most important papers for this section are: (Bocken et al., 2014; Tiba et al., 2021). Also attempts to provide a comprehensive overview of the emergence of open innovation in a general way. The most important papers for this section are: (Chakrabarti et al., 2020; Chesbrough, 2012). It then delves into venture capitalists. The most important papers for this section are: (Battisti et al., 2022; Bendig et al., 2022; Bocken, 2015). A last section explores the history of the OECD and the EPS index. The most important papers for this section are: (Bianchini & Croce, 2022; Botta & Kozluk, 2014; Kruse et al., 2022).

With these objectives in mind, the literature review seeks to provide insights that can help policymakers, investors, entrepreneurs and other stakeholders promote sustainable development through entrepreneurship (Jeong et al., 2020). The analyzed lettering works were consulted using a number of scientific databases, including ScienceDirect, Research Gate, Jstor, Google Scholar, and others.

2.1 Definition and characteristics of sustainable startups

Start-ups have emerged as major participants in promoting sustainable practices and tackling urgent environmental concerns as innovative and nimble firms (Tiba et al., 2021). The growth of sustainable start-ups reflects a shift in entrepreneurial ethos that goes beyond profit-seeking to include environmental impact. These businesses strive to provide creative solutions that reconcile economic growth with environmental sustainability (Bergset & Fichter, 2015). These start-ups not only seek competitive advantages by incorporating sustainability into their fundamental business models, but they also actively contribute to the achievement of the United Nations Sustainable Development Goals (Nunes et al., 2022).

The fast expansion of sustainable investing, has been aided by venture capitalist, they see the potential for significant financial rewards and beneficial impact. Renewable energy, clean technology, sustainable agriculture, and other environmentally friendly industries are drawing major investment. This connection of economic motivation and environmental aims is altering

old investment paradigms and has sparked a surge of innovation, propelling firms and projects that solve serious global concerns ahead (Ciulli et al., 2022; Lin, 2022).

The Figure 2.1, depicting the global expansion of sustainable investing activities from 2012 to 2020, demonstrates a tremendous shift in responsible investment practices. The graph beginswith a steady growth, a subsequent inflection point toward the middle, and culminating in a surge, which represents the exponential expansion of sustainable investment activity. We can notice in Figure 2.2 that in 2012, Europe has the largest portion of investments in sustainability. While in 2018, Japan and the USA have exponentially increased their investments (Lin, 2022).

Figure 2.1: Growth of global sustainable investing assets from 2012 to 2020

Source: European Business Organization Law Review, Venture Capital in the Rise of Sustainable Investment, Published by Lin Lin, Feb 17 2022

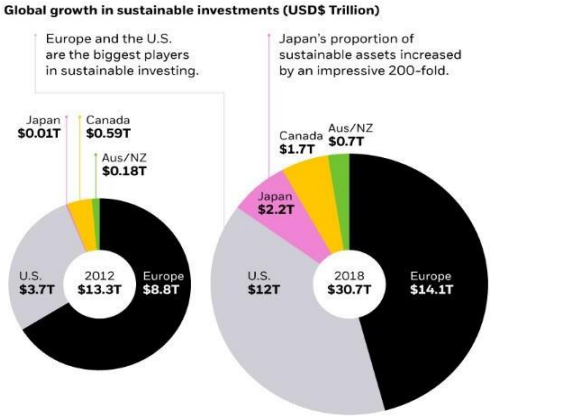


Figure 2.2: Global growth in sustainable investments

Source: Visual Capitalist, Visualizing the Global Rise of Sustainable Investing, Published by Iman Ghosh, Feb 4 2020

Sustainable start-ups are new business ventures that prioritize and incorporate environmental responsibility and economic sustainability into their basic business concepts. (Horne & Fichter, 2022). These companies are founded on sustainability ideals such as environmental awareness and economic resilience. Sustainable start-ups actively aim to produce products, services, or technology that not only generate financial returns but also benefit the environment and society as a whole (Bendig et al., 2022).

They recognize the interdependence of ecological and economic systems and strive to have a beneficial impact on all three. These start-ups, which embrace sustainability as a core value, aim to address major global concerns, contribute to sustainable development goals, and drive positive change for a more sustainable and inclusive future (Schlange, 2006).

The strong dedication to sustainability principles is one of the essential characteristics of sustainable startups. This dedication is reflected in their goal and vision, which prioritize environmental preservation and economic growth. According to researchers, this dedication to

sustainability is critical for entrepreneurs to connect their activities with the United Nations Sustainable Development Goals (SDGs) (Schaltegger et al., 2016).

Sustainable businesses take a Triple Bottom Line approach (Figure 6), taking into account not just economic but also environmental implications. They aspire to add value not only to their shareholders, but also to the world and society as a whole. Elkington popularized the TBL paradigm, which emphasizes the significance of measuring success in terms of money and the environment. Sustainable businesses prioritize TBL in order to achieve both commercial success and positive environmental results (Elkington, 1998).

Sustainable startups place a high value on developing ethical supply networks. They strive to ensure that their sourcing and manufacturing methods adhere to fair labor policies, reduce environmental effect, and avoid hazardous materials. These firms contribute to sustainable development and build confidence with conscious consumers by embracing ethical supply chain management (Bocken, 2015).

Transparency and accountability are essential traits of long-term startups, they frequently use sustainability reporting frameworks such as the Global Reporting Initiative or the Impact Reporting and Investment Standards. Transparent reporting allows stakeholders to evaluate the startup's progress toward sustainability (García-Benau et al., 2013).

Long-term ideas that go beyond immediate profit-making are typical of sustainable companies. They are primarily concerned with developing resilient business models that can resist economic and environmental disasters. This strategy allows them to adjust to changing situations while remaining committed to long-term sustainability (Johnson, 2022).

Many sustainable startups adopt the circular economy ideas. They create goods and services that encourage reusing, repairing, and recycling, hence decreasing resource depletion and trash creation. They help to the transformation from a linear, "take-make-dispose" economy to a regenerative and sustainable one by adopting a circular model (Bocken et al., 2014).

2.2 Open Innovation

Henry Chesbrough[1] invented the term "Open Innovation" in 2003 to characterize an emergent phenomena that was unfolding in the global market landscape around the turn of the century. This relatively new trend alluded to how companies throughout the world were producing value and expanding their market offers, and it required a fundamental rethinking of their innovation

[1] Chesbrough, H. W. (2003). The Era of Open Innovation. MIT Sloan Management Review, 44(3), 35-41

processes. H. W. Chesbrough went on to describe how this new pattern made the barriers between a corporation and its surrounding environment less and less significant, allowing for a flow of invention between the two. It helps to integrate environmental objectives into systemic innovation by incorporating stakeholders along the value chain, including industry experts, researchers, consumers and even rivals.

However, problems persist in managing intellectual property, open community participation and aligning incentives for collaboration. Start-ups can manage technological, financial and operational challenges more efficiently by collaborating with partners who have complementary talents and resources. This collaborative model lowers barriers to entry and promotes the creation of creative, long-term solutions (Chakrabarti et al., 2020).

Chesbrough's remarks underline the history of open innovation and its potential to transform sustainable start-ups. Although start-ups are still under pressure to generate short-term returns, the flow of ideas and expertise, both within and outside the organisation, promotes the development of new solutions, thus supporting the growth and influence of sustainable start-ups. Open innovation acts as a stimulus for the technical developments of sustainable start-ups. Collaborative partnerships allow start-ups to access external R&D resources, increasing the speed of innovation (Chesbrough, 2012).

Finally, open innovation has emerged as a revolutionary force inside sustainable startups, altering their approach to innovation and magnifying their effect on global sustainability issues. The study presented demonstrates the numerous good consequences of open innovation, ranging from multidisciplinary cooperation and the incorporation of external knowledge to technical advancements and balanced economic and sustainability innovation. (Kimpimäki et al., 2022; West et al., 2014).

2.3 Funding and Investments

Due to their emphasis on environmental goals in addition to commercial rewards, sustainable companies sometimes struggle to get appropriate finance and investment. However, some impact investors are becoming more aware of the potential value of sustainable startup investments (Morgan et al., 2010).

There's a complex link between green startup funding and incumbent business innovation output. Green investments in startups that have ecologically focused ideas have a substantial influence on incumbents' green innovation initiatives. By investing in these businesses, incumbents get access to new technology, skills, and market insights, speeding their own green

innovation trajectory. This mutually beneficial connection promotes information sharing, resulting in increased adoption of sustainable practices (Bendig et al., 2022).

The research of Bocken focuses on the function of sustainable venture capital as a catalyst for the growth of sustainable enterprises. SVC investors, play a critical role in defining the trajectory of businesses with similar aims. These investors not only give financial money, but also strategic advice, mentorship, and network access. The research focuses on how SVC helps companies succeed by aligning their growth with sustainable principles and encouraging a holistic approach to value generation (Bocken, 2015).

Because of their mission-driven goals, sustainable companies frequently encounter unique financial problems. Green investments and SVC act as bridges, filling financial gaps and overcoming scalability bottlenecks. These funds provide businesses the runway they need to tackle early-stage difficulties (Höchstädter & Scheck, 2015). The confluence of finance, investment, and long-term sustainability has ramifications for regulatory frameworks and policy development. Policymakers may need to alter legislation to fit evolving business models as startups drive innovation and bring disruptive technology. Furthermore, the rise of sustainable startups highlights the need for regulations that encourage and expedite the adoption of sustainable practices across industries (Roberts & Klostert, 2018).

Sustainability thrives in collaborative environments where finance acts as a catalyst for communal progress. Investors not only provide funding but also help entrepreneurs connect with mentors, academic institutions, and industrial partners (Miller & Bound, 2011). This collaborative atmosphere fosters information sharing, accelerates learning, and fosters an innovative culture (Spigel, 2017). Investments are critical in limiting risk for long-term startups. Early-stage investment is a vote of confidence in a startup's purpose and solutions. Startups establish reputation by securing investments, making it simpler to attract following rounds of funding, strategic collaborations, and consumers (Roberts & Klostert, 2018).

2.3.1 Independent Venture Capital

Independent Venture Capital is a critical component of the entrepreneurial ecosystem. Independent venture capital businesses, unlike corporate venture capital or institutional investors, operate freely, focused entirely on discovering, investing, and promoting promising startups and developing enterprises (Fulghieri & Sevilir, 2009). So independent venture capital refers to venture capital firms that are legal entities distinct from the companies in which they

invest. They generate money from institutional and private investors to invest in high-growth businesses (LiPuma, 2006).

By providing both financial capital and strategic coaching to businesses, Independent Venture Capital plays a critical role in igniting innovation, supporting entrepreneurship, and driving economic growth (Bacq & Janssen, 2011). This motivates them to invest in long-term startups. To meet increasedinvestor demand for meaningful investments, several Independent Venture Capital funds are raising cash expressly to invest in sustainable firms (Bertoni et al., 2013). Sustainable startups are exploring innovative ideas to ensure their long-term viability. Independent Venture Capital businesses anticipate a profit potential in this expanding field (Luukkonen et al., 2013).

In comparison to the larger venture capital market, there are very few investment-ready sustainable businesses (Terjesen et al., 2016). Independent Venture Capital businesses enable sustainable entrepreneursto achieve their ambitions, address global issues, and generate long-term change by providing financial support, knowledge, and mentorship (Guo et al., 2015). Sustainable startups, driven by innovative ideas and a commitment to lasting viability, find appeal in partnering with Independent Venture Capitals. Independent Venture Capitals contribute not only financial support but also knowledge and mentorship, aiding sustainable entrepreneurs in navigating complex landscapes (Lin, 2022). One of the difficulties is that many sustainable start-ups operate in industries with longer payback times owing to thenature of their solutions. Independent Venture Capitals may need to revise their return expectations and exit strategy. Furthermore, sectors focusing on sustainability may be exposed to legislative changes and market volatility, adding unpredictability to investment outcomes (Blum, 2015).

Independent Venture Capitals will most likely diversify their portfolios to include start-ups addressing a range of environmental issues, from renewable energy to sustainable agriculture and beyond. Independent Venture Capitals might work with foundations, governments, and businesses to pool resources and expertise in order to have a greater effect (LiPuma, 2006). External variables can have an impact on the sustainability sector, thus Independent Venture Capitals must have solid risk management policies in place to deal with uncertainty. Clear reporting methods will be required to show to stakeholders both financial performance and effect (Jeong et al., 2020).

2.3.2 Corporate Venture Capital

Corporate venture capital refers to equity investments made in startups and small enterprises by existing organizations, often to obtain access to developing technology, new business models, and innovation (Chemmanur et al., 2014). This method allows organizations to diversify their portfolios and seek financial returns while also aligning their investments with particular strategic goals such as sustainability and environmental impact (Maula & Murray, 2001). Corporate venture capital (Corporate Venture Capital) is a crucial channel that has gained significance in recent years, as it coincides the sustainability goals with corporate social responsibility (CSR) performance (Maula, 2005; Panapanaan & Linnanen, 2002).

According to Battisti et al., corporate venture capital symbolizes a symbiotic interaction between existing firms and young entrepreneurs. Corporations use Corporate Venture Capital to get strategic access to startups' unique technology, products, and services. Sustainable startups, with an emphasis on environmental impact, provide a channel for enterprises to sponsor activities that line with their CSR goals (Dushnitsky & Lenox, 2005).

These collaborations go beyond monetary contributions, allowing for information exchange, resource sharing, and collaborative problem-solving. Corporations contribute industry experience, networks, and resources to the table in the form of mentorship and market insights provided by their corporate partners, boosting the startups' scalability and impact (Colombo & Murtinu, 2015).

Corporate venture capital adds stability and legitimacy to funding ecosystem of the sustainable startups. Startups get not just financial backing but also reputation by receiving Corporate Venture Capital, allowing them to attract more investors and partners (Fulghieri & Sevilir, 2009). Corporate venture investors are becoming more aware of the long-term importance of investing in sustainable enterprises. However, obstacles persist due to the intangible nature of environmental rewards, as well as problems in assessing impact (Guo et al., 2015).

While such investments often do not provide short-term financial rewards, they can assist in the development of new solutions to sustainability concerns that produce long-term value for society. The study by Battisti et al. shows the convergence of profit and purpose within sustainable startups by highlighting the relationship between corporate venture funding and CSR performance. Corporate Venture Capital businesses may strengthen their corporate social responsibility and sustainability reputation by investing in sustainable startups (Battisti et al., 2022).

Corporate Venture Capital investments in sustainable startups enable the parent company to experiment with new business models, technologies, and strategies that may be commercialized. Collaboration with purpose-driven sustainable startups may help Corporate Venture Capital businesses recruit and retain people who desire work-life balance and social mission alignment (Schaltegger et al., 2012).

2.3.3 Government Venture Capital

Government Venture Capital (Government Venture Capital) is a critical tool used by governments to foster economic growth, innovation, and entrepreneurship within their own national ecosystems. It entails allocating public funds to invest in startups and developing firms in order to drive job creation, technical improvement, and the development of a healthy entrepreneurial ecosystem. Government Venture Capitals have made a significant move toward investing in sustainable companies in recent years, reflecting a greater emphasis on tackling global concerns and linking investments with larger socioeconomic and environmental goals (D. Cumming et al., 2007).

Government Venture Capitals' increased interest in sustainable businesses stems from an awareness of the critical need to address challenges such as climate change and resource depletion. Sustainable startups have emerged as critical participants in generating new solutions to these difficulties, motivated by a dual focus on profit and beneficial effect. These firms are viewed as strategic investments by Government Venture Capitals, since they align with their goals to promote economic success while contributing to a more sustainable future (Antarciuc et al., 2018).

However, Government Venture Capitals face difficulties along the way. The inherent risks of startups, particularly those venturing into unknown territory in sustainability-focused businesses, necessitate appropriate risk management measures. Furthermore, measuring the actual socioeconomic and environmental benefits of these expenditures is a difficult task. To guarantee that the expected goals are achieved, effective impact measuring techniques and frameworks are required(Alperovych Y et al., 2020).

Government Venture Capital investing in sustainable businesses provides a twofold return on investment in terms of financial profits and beneficial societal effects. Successful companies contribute greatly to economic growth by creating jobs, advancing technology, and innovating. They also contribute to the country's global competitiveness by developing cutting-edge technology and solutions. Furthermore, by investing in firms that promote environmental responsibility, Government Venture Capitals boost their brand and leadership (W. Lee & Kim, 2019).

Looking ahead, numerous disruptive trends in Government Venture Capital investment in sustainable companies are expected. The distribution of money to sustainable businesses is likely to grow significantly as the urgency of global sustainability concerns grows. (G. C. Murray, 2007).

2.4 OECD history

The Organization for Economic Cooperation and Development (OECD) is a long-standing multinational organization that has played an important role in determining global economic and social policies. The OECD was founded in 1961 in response to the need for international collaboration to achieve economic stability, prosperity, and higher living standards among its member nations in the aftermath of World War II (Kirby, 2011).

The Organization for European Economic Cooperation (OEEC), the OECD's forerunner, was established in 1948. The OEEC's mission gradually grew beyond assistance distribution. It evolved into a platform for European governments to debate economic challenges and coordinate policy, encouraging collaboration and shared responsibility (Leimgruber & Schmelzer, 2017). The OEEC was renamed the OECD in 1961 to reflect its expanded worldwide objective. Today, the OECD is a genuinely worldwide organization with 38 member nations from diverse areas and continents (oecd.org).

The OECD's primary objective is to advocate policies that improve people's economic and social well-being across the world. Several essential objectives underlay this effort. Economic development is one of these. The OECD aims to promote long-term economic growth by providing a forum for member nations to share information, collaborate on policy initiatives, and conduct economic research. Recognizing the issues of environmental deterioration, the OECD prioritizes sustainable development and environmental conservation. In addition, the organization encourages member nations to coordinate their policies in order to solve similar concerns like as financial stability, trade, taxes, and education (Wolfe, 2007).

2.5 EPS Index

The Environmental Policy Strictness Index (EPS) is useful for evaluating and comparing the stringency of nations' environmental policies since it plays an important role in analyzing the efficiency of environmental laws and their influence on many areas of a country's economic landscape. This index provides a quantitative assessment of a country's environmental policies' soundness and stringency, offering significant insights into its commitment to sustainable development. It then compiles data on policy instruments deployed in various areas (air, water, waste, biodiversity, etc.) and sectors (transportation, agriculture, energy, etc.).

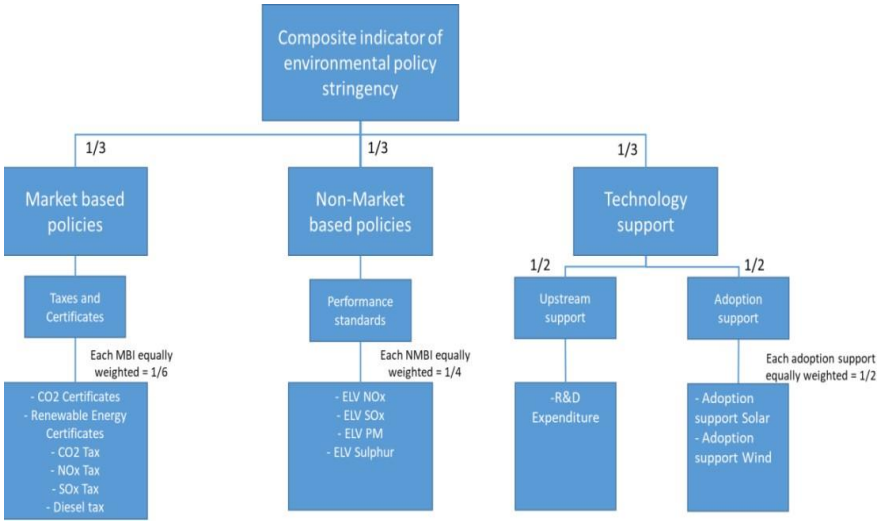


Figure 2.3: Composite indicator of environmental policy stringency

Source: Kruse, T., Dechezleprêtre, A., Saffar, R., & Robert, L. (2022). Measuring environmental policy stringency in OECD countries: An update of the OECD composite EPS indicator

In the Figure 2.3 we can notice how is composed the index EPS and the weights every relative under index, considering also the 3 macro indices. The first macro index Market Based Policies, that deals with Certificates and Taxes, is divided into 6 sub-indices:

- CO2 Certificates: It assesses the regulatory framework and the efficacy of carbon trading schemes.
- Renewable Energy Certificates: It rates the sophistication of policies supporting renewable energy generation and consumption.
- CO2 Tax: This policy assesses the design and rigor of carbon taxing regimes. It also evaluates whether carbon taxes are revenue-neutral.
- Nox Tax: It evaluates the impact of taxes on nitrogen oxide emissions from sources such as autos and industrial facilities.
- Sox Tax: It assesses the efficiency of levies on sulfur oxide emissions, primarily from fossil fuel burning.
- Diesel Tax: It assesses taxes specifically targeting diesel fuel, which can be a major contributor to air pollution.

The second macro index Non-market Based Policies, that deals with Performance standards, is divided into 4 sub-indices:

- Emission Limit Value Nox: It assesses the stringency and enforcement of nitrogen oxide emission restrictions.
- Emission Limit Value Sox: This metric evaluates the regulatory norms that control sulfur oxide emissions.

- Emission Limit Value Sulphur: It likely focuses on emission limits specifically related to sulfur emissions from various sources.
- Emission Limit Value PM: It assesses policies and standards related to particulate matter emissions.

The third macro index Technology Support Policies, that deals with Adoption support and Upstream support, is divided into 3 sub-index:

- R&D Expenditures: It assesses government spending in clean technology research and development. Furthermore, it examines the distribution of money to various sectors of environmental innovation, as well as engagement with private sector R&D activities and the conversion of research into actual solutions.
- Adoption Support Solar: It evaluates policies that encourage the use of solar energy, such as subsidies and incentives.
- Adoption Support Wind: It likely focuses on policies supporting the adoption and expansion of wind energy.

OECD nations have higher EPS Index ratings than non-OECD countries due to their advanced economies and industrialisation. Because of their higher financial resources, technical skills, and institutional frameworks, OECD nations have a stronger ability to execute and invest in ecologically strict policies. According to Bianchini&Croce, 2022, stricter environmental standards create compliance demands and market incentives for cleantech solutions, which can act as catalysts to increase venture capital investment in cleantech companies. Is based on the idea that stringent environmental standards indicate a favorable business climate for sustainable solutions.

Investors are more willing to invest in cleantech companies in countries with a high EPS index because these policies offer stability, fewer regulatory concerns, and possible market advantages. Countries with above-average EPS scores on average attracted much higher total amounts of cleantech venture capital during the study period than countries with below-average scores. This empirically demonstrates that progressive environmental regulations drive private sector interest and money flows toward the clean technologies needed for sustainable development and low-carbon transitions and to capitalize on related growth opportunities. As a result, the EPS index is a useful tool for policymakers and investors seeking to identify nations with high potential for attracting venture capital investment in the cleantech sector.

Interestingly, according to Kruse et al.'s update of 2022 of the OECD EPS index, stringency has grown more rapidly in recent years in growing nations such as China, India, and Brazil, which are attempting to control major pollution problems and change to greener development patterns. While being less rigorous generally than OECD norms, these nations' rising environmental ambition suggests attractive prospects for investment in clean technology and collaboration with enterprises in more advanced green industries. It demonstrates that more strict environmental rules that drive demand and market development are associated with increased flows of venture capital to fund cleantech innovation.

Its relationship with venture capital investment in cleantech enterprises emphasizes the need of strong environmental standards in recruiting venture capital. A favorable policy environment, may stimulate innovation, boost sustainable entrepreneurship, and increase the attractiveness of cleantech investment.

2.6 Literature Gap

The "literature gap" identified by the literature review concerns the lack of in-depth studies examining the link between the stringency of environmental policies, particularly those related to the Upstream Support index, and investments by Independent Venture Capital, Corporate Venture Capital and Government Venture Capital in sustainable startups. In other words, most previous studies have examined the relationship between environmental policies and investments, but have not explored in depth how the degree of stringency of thesepolicies can specifically influence investments in startups that focus on environmental sustainability.

This gap in the literature is significant because it suggests that we do not yet have a complete understanding of how environmental policies directly influence the attractiveness of investments in startups seeking to address environmental challenges. The lack of detailed data and analysis on this topic may prevent the formulation of effective policies to promote investment in this area. Therefore, this study, which addresses this "literature gap," examines in detail how the stringency of environmental policies, particularly the Upstream Support index, influences the investment decisions of Independent Venture Capitals, Corporate Venture Capitals, and Government Venture Capitals in sustainable startups. This type of research could help provide important insights for government policies and entrepreneurs seeking to create and finance startups geared toward environmental sustainability.

The Research Hypothesis is: What role do sustainability play in venture capital investments? What are the effects of upstream support policies on venture capital investments in sustainable startups?

The sperimental research proposed in this thesis aims to investigate the extent to which sustainability acts as a catalyst in investment decisions of three main categories of investors: Independent Venture Capital (Independent Venture Capital), Corporate Venture Capital (Corporate Venture Capital) and Government Venture Capital (Government Venture Capital). At the same time, it aims to evaluate the effectiveness of the incentivepolicies proposed by the Organization for Economic Cooperation and Development (OECD), with particular attention to the Environmental Policy Stringency (EPS) Index and the Upstream Support Index, promoting and supporting this type of sustainable investment.

According to the studies analyzed, the hypothesis of this study supports that sustainability strongly and positively influences GVC investments. For this reason, the Upstream Support Index does not condition investment in sustainable startups, because they do not need additional incentives.

3. METHODOLOGY

The next step we will cover is to define exhaustively and comprehensively the analysis tools and tools that will be used from now on in this research. The objective of this chapter will be to introduce the data, variables, software tools and analysis methods used to empirically test whether VC investments are inlfuenced by sustainability, and whether Upstream support can condition them.

It is important to note that the analysis we are about to undertake is derived from a panel dataset, in that it is based on a sample of observations that follow one another over time, each of which is defined by a particular year of observation. Moreover the construction of the final dataset is determined by the aggregation of two datasets that will be analyzed in detail and exposed in this chapter.

The empirical data that support our methodology is first presented, with a dissertation of their contents and sources that have been addressed to retrieve them. Passing, the real variables of interest for our survey will be constructed and presented, and the main expected results regarding the influence of the main regressives on the response will be indicated. Finally, the choices made regarding the STATA modules actually selected for the conduct of regressions will be justified.

3.1 The dataset

The dataset represents the set of start-ups of our interest analyzed in this study, considering the investments received from 2010 to 2022. The variables present in this dataset express the relationship between start-ups with the investments made to the start-ups themselves, as the number of investors and lead investors, the investment rounds, the amount of money and patents collected. In addition, this dataset also includes the year and the headquarter location. There is also a variable that considers whether the start-up is sustainable, as it is of key interest to the study. It also contains the EPS index, aggregated and disaggregated.

3.2 Data collection

The data in this dataset, which will be used to perform the analysis, are data obtained from the Department of Engineering, University of Palermo, on which other thesis students from previous years have worked, making the necessary changes to the variables of interest, searching through Crunchbase database.

In particular, the original dataset presented 48 control variables. Of which two very important variables are *Name of Lead Investors* and *Top 5 Investors*, through which we were able to calculate the number of VCs who invested in each start-up.

Subsequently, variables were added corresponding to each type of investor (Independent Venture Capital, Corporate Venture Capital, Government Venture Capital, Angels, Incubator, Accelerator, etc.), where all the names of the investors belonging to that specific type of investor, who invested on a start-up to a given year, were reported. Taking into account the *Name of Lead Investors* and *Top 5 Investors*, each of them was searched on Crunchbase and placed in the column corresponding to the type of investor. Crunchbase is an online platform that contains commercial information from public and private start-ups (Know&Lee, 2018).

The type of investor was determined on the basis of several factors, the main way of verification was, for each investor, to check in the summary section, in particular in the about section and see in correspondence of the type of investor, which it was. In addition, another method, in case it was not already determined in this section, was to consider in which round the investment belonged or to analyze the brief description of the company under consideration, or to do further research on the Internet.

Next to each variable indicating the type of investor, another variable has been added that represents the number of investors for a specific type of investor for a specific start-up to a given year. So as to have the count of each type of investor, to facilitate later analysis on STATA. In particular, this variable has been calculated using a formula in Excel, taking into account the number of names written in the corresponding investor type column. Then this formula considers the number of commas present among each investor, for a specific type of investor.

Furthermore, control variables have been added to this dataset under analysis. In particular, we have inserted a binary variable corresponding to each country present in the second dataset analyzed, considering all the OECD and non-OECD weights present. As a result, 33 new dummy variables were added. In particular, comparing the headquarters location for each start-up, we put 1 when the country corresponded to the headquarters location, 0 if not when it did not match. At the end of this process we obtained for each country all the start-ups born in that country.

As a final step, the second dataset was flipped to the first dataset, taken from the OECD statistical website, which will be analyzed in detail in the *moderator variable* section. It was flipped by taking the headquarters of each startup as a reference, matching them with the countries in the second dataset.

Then all variables and consequently all columns were included, for each sub-index analyzed above: *CO2 Certificates, Renewable Energy Certificates, Carbon dioxides (CO2) Tax, Nitrogen Oxides (NOx) Tax, Sulphur Oxides (SOx) Tax, Diesel Tax, Emission limit value NOx, Emission limit value SOx, Emission limit value sulphur, Emission limit value PM, R&D expenditures, Adoption Support Wind and Adoption Support Solar* (Kruse et al., 2022).

This was done by filtering the years from 2010 to 2020, then excluding and not placing any value for the years 2021 and 2022, and filtering the start-ups through the control variable of the countries corresponding to the headquarter location. So, for each country present among the control variables in the dataset the value corresponding to the sub-indexes was added, while for countries not present among the control variables no value was entered.

Once joined the two datasets we had the complete dataset, in order to directly analyze all the variables together.

The following moderation variables have also been added: *Performance standards, Certificates, Taxes, Adoption support, Upstream support*. These variables have been added as macro indices of the EPS index. Each of these has been calculated using a formula that considers the sub indices present within the dataset. Below are the formulas used in Excel to calculate each index:

$$Performance\ standards = \frac{ELV\ NOx + ELV\ SOx + ELV\ Sulphur + ELV\ PM}{4} \quad (1)$$

$$Certificates = \frac{CO2\ Certificates + Renewable\ energy\ certificates}{2} \quad (2)$$

$$Taxes = \frac{CO2\ Taxes + NOx\ Taxes + SOx\ Taxes + Diesel\ Taxes}{4} \quad (3)$$

$$Upstream\ Support = R\&D\ Expenditure \quad (4)$$

$$Adoption\ Support = \frac{Adoption\ Support\ Wind + Adoption\ Support\ Solar}{2} \quad (5)$$

Updated EPS aggregation structure

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Level 0		**Level 1**		**Level 2**	**Level 3**	**Weight within Level 2**	**Weight in the overall index**
EPS index	0.33	Non-Market based indicator	1.00		ELV NO_x	25%	8.25%
					ELV SO_x	25%	8.25%
					ELV PM	25%	8.25%
					Sulphur content limit for diesel	25%	8.25%
	0.33	Market based indicator	1.00		CO2 certificate	16.7%	5.5%
					Renewable energy certificates	16.7%	5.5%
					CO_2 taxes	16.7%	5.5%
					NO_x taxes	16.7%	5.5%
					SO_x taxes	16.7%	5.5%
					Fuel taxes (diesel)	16.7%	5.5%
	0.33	Technology Support	0.50	Upstream support	R&D expenditure	100%	16.5%
			0.50	Adoption Support	Adoption support solar	50%	8.25%
					Adoption support wind	50%	8.25%

Figure 3.1: Updated EPS aggregation structure

Source: Kruse, T., Dechezleprêtre, A., Saffar, R., & Robert, L. (2022). Measuring environmental policy stringency in OECD countries: An update of the OECD composite EPS indicator.

The figure 3.1 shows the weight of each component of the EPS index:

$$EPS = Performances\ standards * 0,\bar{3}3 + Certificates * 0,\bar{1}1 + Taxes * 0,\bar{2}2 + Upstream\ support * 0,1\bar{6}6 + Adoption\ support * 0,1\bar{6}6 \quad (6)$$

This process has made sure that each student had a different macro index to analyze later on STATA. Moreover, the dataset in question has 31,774 observations, with a total of 3715 start-ups, considered over a period of time between 2010 and 2022, and dependent, independent, control and moderator variables.

3.3 Sample selection

Given the immense amount of country dummy, the control variables were grouped into other macro control variables: *OECD, USA, Europe, Asia, Other*. As a result, it was easier to identify the geographical area corresponding to each start-up. These control variables are always binary, so it was put 1 when the location of a start-up corresponded with the variable, 0 if not. The other control variables corresponding to the countries and not to the macro geographical areas have been left as useful for the reversal of the second dataset.

Another step for the data selection was to hide all the columns containing the 13 indices of the EPS Index, as they were grouped into 5 macro indices, each of which will be analyzed by a different student. So 33 control variables and 13 moderator variables were hidden.

Moreover, only the types of investors belonging to the Venture Capital category, named Independent Venture Capital, Corporate Venture Capital and Government Venture Capital, are of fundamental importance for this research. As a result, it was considered appropriate to group all other types of investors in the existing variable *'Other Investors*'. As a result the N.Other variable has been updated. This resulted in a dataset of 31,774 observations, 3715 start-ups and 54 variables, of which1 independent (*SUST*), 3 dependent (*Independent Venture Capital, Corporate Venture Capital and Government Venture Capital*) and 6 moderator (*EPS, Performancestandards, Certificates, Taxes, Upstream, Adoption support*).

But, since the analysis on STATA will be done on the investments made on start-ups, all start-ups that received at least one investment from Independent Venture Capital or Corporate Venture Capital or Government Venture Capital were filtered out andall start-ups that didn't receive even one investment were eliminated. At this stage we no longer considered the variable *Other Investors*, as our analysis will focus only on VCs. As a result, the dataset has been drastically reduced, but especially the number of observations, in fact we can note that from 31,774 observations has been passed to 722 observations. And besides from 3715 start-ups it has been passed to 368 start-ups.

In addition, for the purposes of the subsequent STATA study, all variables containing strings, such as *'Organization Name'*, have been deleted, as the variable *'Company ID*' that indicates this variable numerically is already present. Another variable now superfluous and not analyzed on STATA is *'Headquarter Location'*, as also in this case this variable had already been divided into binary variables: *OECD, USA, Europe, Asia* and *Other*.

Another control variable that we analyzed was *'Founded Date'* together with the '*Age*' control variable. These two represented the same variable but formulated differently. So we have decided to eliminate the variable *'Founded Date'*. Moreover the variable *estimated revenue range*, since it introduces 431 obs on 722 obs, and it's an estimate of the size of the startup, has been considered not of fundamental importance as is already present the variable *size*, consequently it is eliminated. In addition, the binary variables '*IPO*' and *'M&A'* were excluded from the statistical analysis because of their low frequency of occurrence in the data. Specifically, the variable '*ipo*'had a value of 1 in only 4 cases out of 722 observations, while the variable *'m&a'* had a value of 1 in only 7 cases out of 722 observations. This makes it difficult to draw meaningful conclusions or establish reliable correlations with other variables.

Finally, of paramount importance, we also removed all string variables containing investor names : *'Name of Lead Investors', 'Top 5 Investors', 'Independent Venture Capital', 'Corporate Venture Capital'* and '*Government Venture Capital*'. The first two variables were no longer useful as the analysis had now focused only on Independent Venture Capital, Corporate Venture Capital and Government Venture Capital. In addition, it was possible to delete the variables *Independent Venture Capital, Corporate Venture Capital* and *Government Venture Capital*, since the variables *nIndependent Venture Capital, nCorporate Venture Capital* and *nGovernment Venture Capital* were present, and we also decided to eliminate the variables *'N. lead investor'* and *'N. investors'*, as they were no longer important for analysis. This resulted in a dataset of 722 observations, 368 start-ups and 34 variables, of which 1 independent (*SUST*), 3 dependent (*nIndependent Venture Capital, nCorporate Venture Capital* and *nGovernment Venture Capital*) and 5 moderator (*Performance standards, Certificates, Taxes, Upstream support, Adoption support).*

3.4 Model description

In the *indipendent variable* section, the method of classifying start-ups into sustainable start-ups will be explained, through searches conducted on Crunchbase. The following graphs represent the number of sustainable start-ups, in which the value 1 is placed to start-ups deemed sustainable, the value 0 takes the opposite meaning. The first graph represents this analysis on a start-up sample of 3715, while the second graph on a sample of start-ups equal to 368. We can see that in the figure 3.3 the number of sustainable start-ups

represents about 3% of the total, while in the figure 18 it represents about 6,5% of the total start-ups. Consequently, we can infer that by considering investments from Independent Venture Capitals, Corporate Venture Capitals, and Government Venture Capitals, the number of sustainable start-ups increases. Consequently, the *SUST* variable assumes more importance in the presence of investments by Independent Venture Capitals, and next, through STATA analysis, we will see whether or not this variable influences the number of investments by VCs or not.

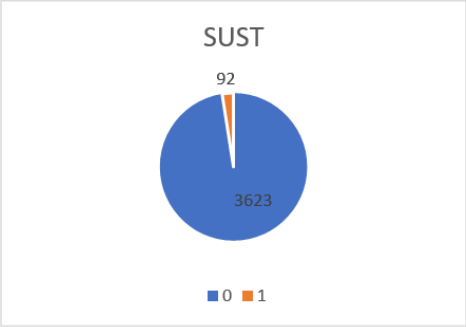


Figure 3.2: Number of sustainable startups.

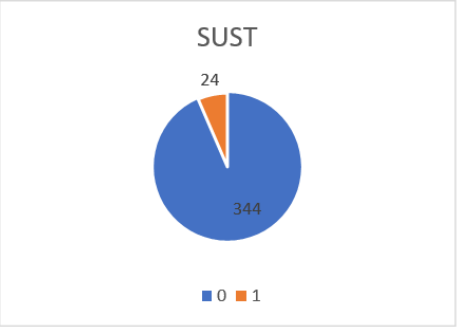
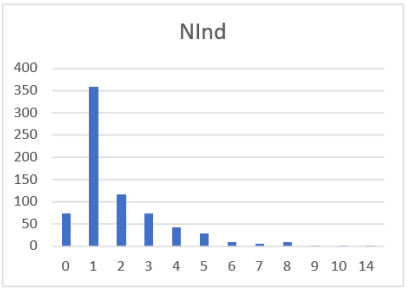


Figure 3.3: Number of sustainable startups, taking into account the VCs investments.

There are also 3 dependent variables, which will be examined in detail in the *dependent variables* section, whose trends are interesting. Particularly in the figure 3.4, depicting the number of Independent Venture Capitals, it is easy to see that out of 722 observations only for 73 the value equals 0, so there is a high presence of investment from Independent Venture Capitals towards the start-ups in this dataset. In particular the number of Independent Venture Capitals goes up to a maximum of 14 for only one start-up, we can also see that most of the start-ups have only one investment from Independent Venture Capital, specifically 358 observations have the value 1.

Figure 3.4: Number ofobservations for the variable nIndependent Venture Capital.



The figure 3.5 and 3.6 show the number of Government Venture Capitals and Corporate Venture Capitals again for 722 observations. It is easy to see the clear difference with the number of Independent Venture Capitals, as these two graphs have a larger value at the 0 value. This means that most of the investments in the dataset belong to Independent Venture Capitals, and

that Government Venture Capitals and Corporate Venture Capitals did not make many investments in the startups under analysis, with anumber equals 0 of 644 and 622 observations, respectively.

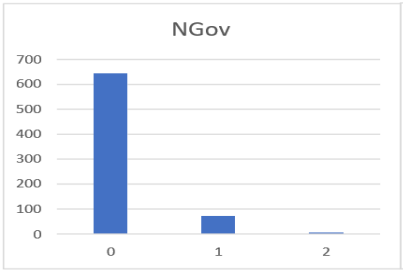


Figure 3.5: Number of observations for the variable nGovernment Venture Capital.

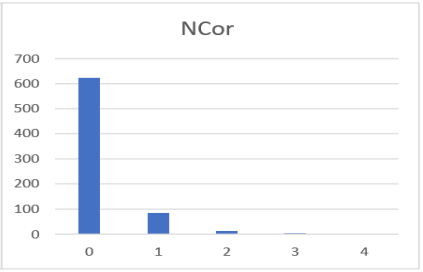


Figure 3.6: Number of observations for the variable nCorporate Venture Capital.

3.5Dependent variables

Modeling the data to perform the analysis begins with the choice of the dependent variables. As mentioned, the main objective of the study is to understand how sustainability impacts the choice of a given VC to invest in it.

Therefore, the variables *NIndependent Venture Capital*, *NCorporate Venture Capital*, and *NGovernment Venture Capital* are the dependent variables that will be used during the analysis. In such an analysis, these variables play a crucial role in measuring the flow of investment directed toward sustainable start-ups and can provide valuable insights into market dynamics.

- *NIndependent Venture Capital:* This variable represents the number of investments made by Independent Venture Capital in start-ups. An increase in the number of Independent Venture Capitals could indicate increasing investor interest in startups, which could be related to growth opportunities or increased perception of the profitability potential of start-ups. It is defined in a range from 1 to 14.
- *NCorporate Venture Capital*: This variable represents the number of investments made by Corporate Venture Capital in start-ups. Corporate interest in funding sustainable start-ups can be seen as a sign of a long-term commitment to the sector and may also suggest potential synergies between large companies and start-ups. It is defined in ranges from 1 to 4.
- *NGovernment Venture Capital*: This variable represents the number of investments made by Government Venture Capital in start-ups. Government Venture Capital investment can be used to support sustainable development and innovation, and can be an important indicator of policy support for the start-up. This variable is defined in a range from 1 to 3.

3.6 Independent variable

Since the study focuses on sustainability, the independent variable chosen, following de Lange & Vallier's methodology, is the binary variable "*SUST*", which assumes the value 1 if the startups are defined as green, otherwise 0. This variable allows you to assess whether the fact that a startup is sustainable or not, affects the probability of receiving an investment from a VC (Mrkajic et al., 2019).

At this point it was necessary to establish a method by which to identify in the sample the green startups, which will be the fundamental point of the study. The method chosen was the one used by de Lange & Vallier in their 2019 study. They take into account the sector in which the startup operates to identify whether it can be defined as "sustainable".

Crunchbase returns information about the sub-industry in which each startup operates, and each sub-industry is part of one or more macro-industries. It was decided to consider sustainable all start-ups that presented themselves as "Industry" on Crunchbase, the macro-category "Sustainability" that means belonging to at least one of its subcategories, listed in Table 3.1.

Biofuel	Green Building	Renewable Energy
Biomass Energy	Green Consumer Goods	Solar
Clean Energy	GreenTech	Sustainability
CleanTech	Natural Resources	Waste Management
Energy Efficiency	Organic	Water Purification
Environmental Engineering	Pollution Control	Wind Energy

Table 3.1: Sub-industries related to Sustainablity on Crunchbase

Source: Crunchbase, What Industries are included in Crunchbase?, Published by Crunchbase Product Team, 02/2023

In total, as mentioned above, the number of observations containing a sustainable start-up is 61 out of a total of 723 observations, specifically the sustainable start-ups are 24 out of a total of 368 startups.

3.7 Moderator variable

As mentioned earlier, the moderating variable in this research is the *Upstream Suppot* variable, which deals with *R&D Expenditure*. This variable is used for analyze the influence of the R&D Expenditure policies regarding investments by Independent Venture Capital, Corporate Venture Capital and Government Venture Capital on startups, with a particular focus on sustainable ones. So to take into account specifically the relationship between the Environmental Policy Stringency Index and the sustainability factor and how this relationship affects the choice of Independent Venture Capitals, Corporate Venture Capitals and Government Venture Capitals to invest in startups or not.

The dataset containing the moderation variable were taken from the site that analyzes the statistics of OECD countries (stats.oecd.org), taking into account the Environmental Policy Stringency Index. This dataset was downloaded both in aggregate form, considering only the EPS index, and disaggregated into all possible sub-indices, containing both OECD and non-OECD countries. This data set presented a time series from 1990 to 2020. As mention before, from this site then 3 macro indices (*Market Based Policies, Non-Market Based Policies and Technology Support*) and 13 sub-indices were downloaded. In addition, as the time series was very extensive and the dataset exposed above were from 2010 to 2022. It has been chosen to take into account only the data from 2010 to 2020, excluding all data before 2010 because it is not of fundamental importance for the analysis that will be made later.

About the public R&D expenditure, analyzed in detail by Kruse, Botta and Bianchini, is an indicator that represents the amount a country spends on developing low-carbon technologies relative to the size of its economy. It covers areas like renewables, energy efficiency, CCS, nuclear, hydrogen and energy storage. The value is calculated by dividing public R&D spending by GDP and multiplying by 1000 for readability.

Government funding of R&D helps address market failures in innovation markets. Companies often underinvest in early-stage R&D due to risks and challenges recouping costs. Public support helps lower costs. R&D subsidies targeted at emerging technologies can help drive their improvement and cost reductions over time. Through learning and economies of scale, support helps to lower expenses over time.

Reduced public support for clean technology may result in decreased innovation and technical advancement, delayed commercialization, lost economic opportunities, trouble fulfilling climate targets, geopolitical repercussions and stranded fossil fuel operations.

Private investment in early-stage R&D may drop if there is no governmental assistance to help manage market risks and failures. Technology would have greater prices and longer lead times. Without sustained support for R&D and demonstration projects, emerging technologies may struggle to achieve the stages of diffusion and competitiveness. Countries that spend more may obtain a competitive edge in the future cleantech industry. Furthermore, diminished support may damage domestic industries. Many studies predict that existing technologies will need to evolve greatly for countries to meet zero-emissions targets by mid-century. These objectives may be jeopardized if they are not supported.

Changeover expenses would rise. If sustainable alternatives are not cost-competitive when fossil-fuel infrastructure is decommissioned, corporations and governments may face greater transition costs. Inadequate clean replacements may lengthen the life of infrastructure

investments in coal, oil, and gas projects, potentially resulting in stranded assets. Leadership in the cleantech sector transfer to countries that invest more in innovation.

From the 1990s to 2011, R&D and other technological support policies expanded, before dropping in the early 1920s for both feed-in and spending rates. Support rose again in the late 2010s, but stayed below 2011 levels. A limited EPS index that excludes technical support may be beneficial for analyzing non-energy firms that are less impacted by policies like tariffs or R&D spending. R&D and low-carbon patent applications surged until 2011, then fell until 2015, indicating a fall in innovation funding. Since 2011, two causes have been driving the reduction in the rigor of technology support policies. To begin, R&D subsidies (in low-carbon energy technologies) have declined in proportion to GDP.

The development and implementation of new clean technologies is critical for reducing emissions to net zero by the middle of the century and lowering transition costs. This falling trend in R&D subsidies raises concerns that government funding for clean technology is dwindling at a time when encouraging innovation in clean technologies is more critical. Furthermore, following the global crisis of 2008, budgets were tightened as short-term stimulus expired, and fiscal austerity has been in effect since 2010. While clean R&D activity surged from 2009 to 2012, the pressure mounted subsequently in a belt-tightening setting. This has most likely reduced government spending. Massive emissions reductions necessitate continual innovation acceleration.

While clean R&D activity surged from 2009 to 2012, the pressure mounted subsequently in a belt-tightening setting. This has most likely reduced government spending. Massive emissions reductions necessitate continual innovation acceleration. However, the strains of the recession and political pressures to reduce deficits might stymie investment in remedies that are especially needed today. Furthermore, based on the country's debt growth from 2008 to 2011, the financial crisis may have contributed modestly to the drop in expenditure on technological support between 2011 and 2016.

The second point is that governments have begun to replace feed-in tariffs (fit) as the primary policy tool for promoting renewable energy with renewable energy auctions. Because the prices of renewable energy have reduced dramatically, the incentives guarantee a constant price per unit of clean power, which can be expensive and inefficient. The revised EPS index adjusts metrics based on overall power prices to account for the decreased costs of renewable energy. It also includes data from nations that use auction prices on the average prices assigned. Future versions of the EPS may incorporate renewable energy auctions as an independent component in the index, reflecting governments' greater usage of them.

Furthermore, limiting the policy index to policies that promote technology might help evaluations of energy-saving firms that are less impacted by incentives such as subsidies or mandated prices. In reality, when both indices are closely followed until 2011, EPS initially declines and then grows, whilst the restricted version of EPS - which removes technological support measures - continues to rise. This highlights the importance of technology support policies in contributing to the recent flattening of the overall EPS.

In addition, the R&D Expenditure index ranges from 0 to 6, as reported in the paper by Kruse et al., 2022. Observations with no policy in place receive no value. The remaining scores are calculated using the distribution of observations with the policy in place. The highest score, six, is granted to observations with values greater than the 90th percentile of those when the policy is applied. The difference between the 90th and 10th percentiles is split into five equal bins to determine the remaining scores.

3.8 Control variables

Control variables play a fundamental role in data analysis. They are used to manage and regulate the influence of external factors or independent variables on the dependent or interest variable. In general, the appropriate use of control variables is essential to conduct robust and accurate analysis and to achieve reliable and meaningful results.

Considering the control variables, it was decided to take as a reference some variables already dealt with in the literature. Among these variables, it was decided to consider the headquarter location of the start-up as a factor that could influence the propensity to invest in start-ups, as also influenced by the policies of each country. For this reason, the control variables '*OECD', 'USA', 'Europe', 'Asia', 'Other'* have been created, assuming the value 1 if 1 if the headquarter location of the start-up corresponds with the variable, otherwise 0.

It was decided to consider the age of the start up, creating a counting variable '*Age*', calculated, as the difference between the year of foundation and the variable '*Year*', defined in a range from 1 to 13 (de Lange & Valliere, 2020).

Moreover, the size of the startup, considered as the number of employees, is an important control variable to consider (Battisti et al., 2022; De Lange & Valliere, 2020). In a variety of contexts, it has been found that the size of the entrepreneurial team is positively correlated with venture performance as larger teams are more likely to have more resources (Mrkajic et al., 2019). As a result, two control variables were used:

- *Size*: As mentioned above, is measured by the number of employees, is a categorical variable, created as follows (Battisti et al., 2022; De Lange & Valliere, 2020):
  1 → 1 – 10; 2 → 11 -50; 3 → 51 -100; 4 → 101 – 250; 5 → 251 – 500; 6 → 501 – 1000; 7 → 1001 – 5000; 8 → 5001 – 10000; 9 → plus 10001
- *Number or Founders*: This variable reflects the value of goodwill and must therefore be taken into account. It has been defined in a range from 1 to 7, based on how many founders the company has (Mrkajic et al., 2019).

In addition, additional control variables have been included to take into account shares that investors reflect on the life cycle effects of a start-up:

- *Round*: The 'Round' variable indicates the number of funding rounds reached by the start-up, then the number of investment cycles received per year, and has been considered a range from 0 to 8 (de Lange & Valliere, 2020).
- *Patents Granted*: Is a counting variable that defines the number of patents held by the start-upup. This variable was included in the study because can be excellent signals of quality for a start-up (Battisti et al., 2022; De Lange & Valliere, 2020; Munari & Toschi, 2015; Zhou et al., 2016). To mitigate high dispersion, logarithm was used, transforming it into a range between 0 and 6,524.
- *Money Raised*: Is a continuous variable, and represents the amount of funding received annually, in dollars. The latter has been transformed using the logarithm to limit dispersion and is defined in the range from 0 to 21,126 (Davila et al., 2000; Nanda & Rhodes-Kropf, 2013).
- *IPO*: The IPO variable was designed as a binary variable that takes value 1 in the year the company becomes public, 0 otherwise, as de Lange & Vallier did in their study in 2019. It is important because being an indicator that determines the possibility of making an initial public offering, is observed by VCs.
- *M&A*: The M&A variable has been programmed as a binary variable, which takes value 1 if the start-up was acquired, 0 otherwise (De Lange & Valliere, 2019). Investors see M&A exit as a type of successful exit, it is a way to consolidate their business or company: In fact, established companies typically pay high premiums for acquiring high-potential startups (Cotei & Farhat, 2019).

In addition, six fictitious variables have been created: *Grant, Seed, Early-Stage Venture, Venture Round, Late-Stage Venture, Other Investment* to indicate the type of funding received by start-ups, which take the value 1 if the start-upup received that type of investment in a given year, 0 if not (Gompers & Lerner, 2001; Hegeman & Sørheim, 2021; P. M. Lee et al., 2011) :

- *Grant*: is a dummy variable that represents 1 if an investment was received during the grant phase, 0 otherwise. Grant when a company, investor, or government agency provides capital to a company without taking an equity stake in the company.
- *Seed*: is a dummy variable that represents 1 if an investment was received during the seed stage, 0 otherwise. It is among the first funding rounds a company receives, typically when the company is young and working to gain traction.
- *Venture Round*: is a dummy variable that represents 1 if an investment was received during a venture round, 0 otherwise. It refers to an investment from a venture capital firm and describes the Series A, Series B, and subsequent rounds. Is used for any funding round that is clearly a venture round but where the series was not specified.
- *Corporate Round:* is a dummy variable that represents 1 if an investment was received during the Corporate Round, 0 otherwise. Often is an investment aimed at forming a strategic partnership, usually occur at more mature stages of the company.
- *Early Stage Venture*: is a dummy variable that represents 1 if an investment was received during the Early stage venture, 0 otherwise. It is the early stage of startup development, in which they seek funding for research, prototype creation, and launch of their products or services. Key characteristics include a limited customer base, greater uncertainty, and the need to prove the value of their concept.
- *Late Stage Venture*: is a dummy variable that represents 1 if an investment was received during the Late stage venture, 0 otherwise.It represents a more advanced stage where startups have achieved some success and are seeking funding to grow further, develop new products, or enter new markets. Typical characteristics include a large customer base, higher valuation, and greater business maturity.
- *Other Investments*: is a dummy variable that represents 1 if an investment was received during one of the stages not mentioned before, 0 otherwise. It refers to a set of different types of investments, which were small in number in our sample.

The table 3.2 is a summary of all variables, with every detail reguarding the variable name,variable type, description, and reference.

VARIABLE	VARIABLE NAME	TYPE	DESCRIPTION	REFERENCES
DEPENDENT VARIABLE	*Independent Venture Capital*	Count	Defined in a range from 0 to 14	*Bianchini&Croce, 2022*
DEPENDENT VARIABLE	*Corporate Venture Capital*	Count	Defined in a range from 0 to 4	*Bending et al., 2022*
DEPENDENT VARIABLE	*Government Venture Capital*	Count	Defined in a range from 0 to 3	*Bianchini&Croce, 2022*

INDEPENDENT VARIABLE	*Sustainability*	Binary	1 if the start-up is sustainable 0 otherwise	*deLange&Valiere, 2019*
MODERATOR	*Upstream support*	Continuous	Defined in a range from 0 to 6	*Bianchini&Croce, 2022; Cojoianu et al., 2020*
CONTROL VARIABLE	*OECD*	Binary	1 if the start-up is located in an OECD country 0 otherwise	*Bianchini&Croce, 2022*
CONTROL VARIABLE	*USA*	Binary	1 if the start-up is located in USA 0 otherwise	*deLange, 2017*
CONTROL VARIABLE	*Europe*	Binary	1 if the start-up is located in Europe 0 otherwise	*deLange, 2017; Battisti, 2022*
CONTROL VARIABLE	*Asia*	Binary	1 if the start-up is located in Asia 0 otherwise	*deLange, 2017*
CONTROL VARIABLE	*Other*	Binary	1 if the start-up is located in other country 0 otherwise	Groh et al., 2018
CONTROL VARIABLE	*Age*	Count	Defined in a range from 1 to 13	*deLange&Valiere, 2019*
CONTROL VARIABLE	*Year*	Count	Defined in a range from 2010 to 2022	*Bianchini&Croce, 2022*
CONTROL VARIABLE	*No of Founders*	Count	Defined in a range from 1 to 7	*Mrkajic, 2019*
CONTROL VARIABLE	*Size*	Count	1 if 1-10; 2 if 11-50; 3 if 51-100; 4 if 101-250; 5 if 251-500; 6 if 501-1000; 7 if 1001-5000; 8 if 5001-10000; 9 if 10001+	*deLange&Valiere, 2019; Battisti, 2022; Cotei, 2018*
CONTROL VARIABLE	*Rounds*	Count	Defined in a range from 0 to 8	*deLange&Valiere, 2019*
CONTROL VARIABLE	*Grant*	Dummy	1 if an investment during Grant Stage is received 0 otherwise	*Hegeman & Sørheim, 2021*
CONTROL VARIABLE	*Seed*	Dummy	1 if an investment during Seed Stage is received 0 otherwise	*Gompers & Lerner, 2001*
CONTROL VARIABLE	*Early_Venture_Stage*	Dummy	1 if an investment during Early Stage is received 0 otherwise	*Gompers & Lerner, 2001*
CONTROL VARIABLE	*Venture_Round*	Dummy	1 if an investment during Venture Stage is received 0 otherwise	*P. M. Lee et al., 2011*
CONTROL VARIABLE	*Late_Venture_Stage*	Dummy	1 if an investment during Late Stage is received 0 otherwise	*Hegeman & Sørheim, 2021*
CONTROL VARIABLE	*Corporate_Round*	Dummy	1 if an investment during Corporate Round Stage is received 0 otherwise	*Hegeman&Sørheim, 2021*
CONTROL VARIABLE	*Other_Investments*	Dummy	1 if other investments are received 0 otherwise	*Hegeman & Sørheim, 2021*
CONTROL VARIABLE	*Money_Raised (ln)*	Continuous	Defined in a range from 0 to 21.126	*deLange&Valiere, 2019*
CONTROL VARIABLE	*Patents (ln)*	Count	Defined in a range from 0 to 6524	*Boris Mrkajic & Al., 2019; Cotei, 2018*

Table 3.2: Variables summary

4. ANALYSIS

The statistical analysis program STATA, version 14.0, was chosen to perform the necessary statistical analysis on the acquired data. STATA is statistical software that includes sophisticated data management functions, a wide range of up-to-date statistical tools and procedures, and an excellent system for creating high-quality graphical results.

The dataset we will be working with is unbalanced, as can be clearly seen using the STATA functions, because not all entities are present at every level of the variable Year. Although the STATA package has the necessary functionality to handle unbalanced datasets, this has direct consequences for the type of analysis that will be performed.

4.1 The regression model and descriptive statistics

STATA allows you to perform a series of regression analyses, depending on the type of data, the assumptions behind the model and the result to be highlighted in the output. In particular, because the dependent variables of type count (*NIndependent Venture Capital, NCorporate Venture Capital* and *NGovernment Venture Capital*) and the unit of analysis is considered to be the investment, will be used regressions of type nbreg and poisson, since both commands are used when you want to examine the relationship between a count dependent variable and one or more independent variables in a dataset.

Typically, the first command to be used is poisson, since it is assumed that the count data is adequately distributed according to a Poisson distribution and that the mean is equal to variance (equidispersion). However, if during the analysis it turns out that the variance is different from the mean , so it is significantly higher (over-dispersion) or significantly lower (under-dispersion), the standard Poisson model may not be suitable. In this case, one can consider the use of nbreg, which is a negative binomial model, known to manage over-dispersion and under-dispersion in data counting.

These descriptive statistics are required to interpret the data, since they help to ensure that the variables are appropriate for the model's implementation and provide for a better understanding and interpretation of the final results. The following are the descriptive statistics of the variables, which in addition to reporting the standard deviation and the average to understand what kind of regression to use, also report the number of observations and the minimum and maximum values of each variable.

Variable	Obs	Mean	Std. Dev.	Min	Max
sust	722	.084	.278	0	1
oecd	721	.775	.418	0	1
usa	721	.458	.499	0	1

europe	721	.243	.429	0	1
asia	721	.19	.393	0	1
other	721	.11	.313	0	1
year	722	2017.367	3.139	2010	2022
age	722	4.035	2.491	1	13
rounds	722	1.201	.68	0	7
numberoffounders	670	2.258	1.239	1	7
size	712	2.545	1.574	1	8
nIndependent Venture Capital	722	1.867	1.713	0	14
nCorporate Venture Capital	722	.166	.459	0	4
nGovernment Venture Capital	722	.116	.346	0	2
grant	722	.05	.218	0	1
seed	722	.325	.469	0	1
earlystageventure	722	.271	.445	0	1
ventureround	722	.12	.326	0	1
latestageventure	722	.046	.209	0	1
corporateround	722	.019	.138	0	1
otherinvestments	722	.093	.29	0	1
lnmoneyraised	569	13.775	4.593	0	21.126
lnpatentsgranted	722	.542	1.168	0	6.524
upstreamsupport	551	2.539	1.397	0	6

Table 4.1: Descriptive statistics

From the Table 4.1 we can see that for the three dependent variables under analysis we are in the case where the mean and variance have values very close to each other, so it is possible to use both poisson and nbreg, consequently the estat gof test will be done for each dependent variable. Moreover, the *other* variable is excluded from the analysis, as having operationalized the startup headquarters with a set of dummy variables, one of the variables must be eliminated to use it as a baseline.

4.2 Correlation analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) sust	1.00										
(2) oecd	0.12*	1.00									
	(0.00)										
(3) usa	0.06	0.49*	1.00								
	(0.10)	(0.00)									
(4) europe	0.02	0.28*	-0.52*	1.00							
	(0.49)	(0.00)	(0.00)								
(5) asia	-0.10*	-0.67*	-0.44*	-0.27*	1.00						
	(0.00)	(0.00)	(0.00)	(0.00)							
(6) age	0.07*	0.02	0.08	-0.03	-0.02	1.00					
	(0.04)	(0.43)	(0.30)	(0.38)	(0.44)						
(7) year	-0.05	-0.02	-0.09	0.02	0.00	0.59*	1.00				
	(0.16)	(0.43)	(0.30)	(0.54)	(0.99)	(0.00)					
(8) rounds	0.00	0.00	0.09	-0.01	0.08	0.01	0.09*	1.00			
	(0.88)	(0.83)	(0.61)	(0.98)	(0.63)	(0.17)	(0.00)				
(9)numberoffounders	0.03	0.05	0.09*	0.03	-0.08*	0.03	0.09*	0.06	1.00		
	(0.41)	(0.14)	(0.02)	(0.73)	(0.03)	(0.17)	(0.01)	(0.07)			
(10) size	-0.02	-0.20*	-0.04	-0.15*	0.11*	0.15*	0.00	0.09*	0.25*	1.00	
	(0.43)	(0.00)	(0.92)	(0.00)	(0.00)	(0.00)	(0.06)	(0.01)	(0.00)		
(11) nIndependent Venture Capital	-0.05	0.08*	0.20*	-0.15*	-0.10*	-0.08	0.09*	0.19*	0.14*	0.25*	1.00
	(0.16)	(0.03)	(0.00)	(0.00)	(0.00)	(0.83)	(0.01)	(0.00)	(0.00)	(0.00)	
(12) nCorporate Venture Capital	0.03	0.05	0.07*	-0.07	-0.06	0.11*	0.09*	0.01	0.09*	0.13*	0.09*
	(0.40)	(0.17)	(0.03)	(0.12)	(0.86)	(0.00)	(0.01)	(0.05)	(0.01)	(0.00)	(0.01)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(13) nGovernment Venture Capital	0.22*	0.08*	-0.08	0.09*	-0.11*	0.00	-0.06	0.09*	0.07	-0.11*	-0.17*
	(0.00)	(0.02)	(0.45)	(0.00)	(0.00)	(0.27)	(0.34)	(0.01)	(0.13)	(0.00)	(0.00)
(14) grant	0.15*	0.10*	0.07	0.10*	-0.09*	0.03	0.08	-0.02	0.02	-0.14*	-0.21*
	(0.00)	(0.00)	(0.85)	(0.00)	(0.01)	(0.15)	(0.83)	(0.75)	(0.27)	(0.00)	(0.00)
(15) seed	-0.02	-0.04	-0.04	0.07	0.09	-0.36*	-0.14*	-0.06	-0.06	-0.22*	-0.09
	(0.16)	(0.51)	(0.14)	(0.12)	(0.60)	(0.00)	(0.00)	(0.33)	(0.08)	(0.00)	(0.29)
(16)earlystageventure	-0.01	-0.07	0.09*	-0.11*	0.00	0.11*	0.04	0.06	0.07	0.16*	0.19*
	(0.63)	(0.32)	(0.01)	(0.00)	(0.42)	(0.00)	(0.08)	(0.48)	(0.08)	(0.00)	(0.00)
(17)ventureround	-0.06	0.06	-0.09*	0.08*	0.06	0.15*	0.08	0.01	-0.08	-0.07	-0.08*
	(0.07)	(0.33)	(0.01)	(0.01)	(0.66)	(0.00)	(0.11)	(0.27)	(0.21)	(0.32)	(0.02)
(18)latestageventure	-0.06	-0.01	0.05	-0.07*	0.09	0.19*	0.10*	0.03	0.11*	0.31*	0.11*
	(0.07)	(0.27)	(0.08)	(0.03)	(0.43)	(0.00)	(0.00)	(0.53)	(0.00)	(0.00)	(0.00)
(19)corporateround	-0.00	-0.05	-0.09	-0.03	0.16*	0.08*	0.08*	0.07	0.04	0.05	-0.09*
	(0.85)	(0.23)	(0.06)	(0.37)	(0.00)	(0.02)	(0.03)	(0.20)	(0.71)	(0.35)	(0.01)
(20)otherinvestments	0.07*	0.05	0.02	-0.06	-0.08	0.12*	0.09	0.32*	-0.08	0.08*	-0.09
	(0.04)	(0.34)	(0.39)	(0.33)	(0.12)	(0.00)	(0.06)	(0.00)	(0.64)	(0.02)	(0.81)
(21)lnmoneyraised	-0.06	0.06	0.09*	-0.06	0.01	0.31*	0.30*	0.50*	0.17*	0.27*	0.20*
	(0.11)	(0.27)	(0.02)	(0.11)	(0.97)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(22)lnpatentsgranted	0.05	0.23*	0.22*	-0.12*	-0.10*	0.16*	0.06	-0.03	0.02	0.25*	0.06
	(0.12)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.86)	(0.38)	(0.40)	(0.00)	(0.66)
(23)upstreamsupport	0.15*	0.80*	0.32*	0.09*	-0.40*	-0.02	0.08*	0.07	0.09*	-0.22*	0.06
	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.60)	(0.04)	(0.17)	(0.02)	(0.00)	(0.07)

Variables	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(12) nCorporate Venture Capital	1.00											
(13) nGovernment Venture Capital	-0.06	1.00										
	(0.10)											
(14) grant	-0.05	0.45*	1.00									
	(0.13)	(0.00)										
(15) seed	-0.15*	-0.09*	-0.15*	1.00								
	(0.00)	(0.00)	(0.00)									
(16)earlystageventure	0.03	-0.08*	-0.14*	-0.42*	1.00							
	(0.93)	(0.01)	(0.00)	(0.00)								
(17)ventureround	-0.04	-0.06	-0.08*	-0.25*	-0.22*	1.00						
	(0.90)	(0.48)	(0.02)	(0.00)	(0.00)							
(18)latestageventure	0.19*	-0.04	-0.00	-0.15*	-0.13*	-0.08*	1.00					
	(0.00)	(0.14)	(0.17)	(0.00)	(0.00)	(0.03)						
(19)corporateround	0.27*	-0.07	-0.02	-0.09*	-0.08*	-0.02	-0.01	1.00				
	(0.00)	(0.20)	(0.38)	(0.00)	(0.02)	(0.16)	(0.40)					
(20)otherinvestments	0.00	-0.01	-0.07*	-0.22*	-0.19*	-0.11*	-0.00	-0.05	1.00			
	(0.28)	(0.76)	(0.04)	(0.00)	(0.00)	(0.00)	(0.06)	(0.22)				
(21)lnmoneyraised	0.13*	-0.08*	-0.09	-0.08	0.31*	0.08	0.18*	0.00	0.13*	1.00		
	(0.00)	(0.03)	(0.15)	(0.49)	(0.00)	(0.06)	(0.00)	(0.09)	(0.00)			
(22)lnpatentsgranted	0.20*	0.08	0.01	-0.19*	0.03	0.04	0.20*	0.03	0.04	0.11*	1.00	
	(0.00)	(0.45)	(0.58)	(0.00)	(0.08)	(0.92)	(0.00)	(0.05)	(0.70)	(0.00)		
(23)upstreamsupport	0.06	0.12*	0.05	0.07	-0.09*	0.09*	-0.06	0.03	0.05	0.07	0.18*	1.00
	(0.18)	(0.00)	(0.20)	(0.86)	(0.02)	(0.03)	(0.07)	(0.13)	(0.72)	(0.32)	(0.00)	

**** p<0.01, ** p<0.05, * p<0.1*

Table 4.2: Table of correlation

Before starting the analysis, it is critical to make sure that the variables do not have a high correlation. Correlations indicate that there are variables that are strongly associated and therefore cannot be used in the same model. The threshold is set at 0.7 to avoid potential multicollinearity problems in the data. In addition, the table is used to have more stability in the model. The correlation coefficients among the study variables are given in the Table 4.

From the table 4.2 we can notice that the *oecd* variable has a strong correlation with the *upstreamsupport* moderation variable, so it is excluded from the analysis on STATA.

4.3 Econometric analysis

This section reports the results of the econometric analysis conducted through STATA.

The analysis was conducted according to the hierarchical regression methodology used by Lange & Vallier 2019, which examines direct and moderate effects separately. Then three different regressions were run for each dependent variable (*nIndependent Venture Capital, nCorporate Venture Capital* and *nGovernment Venture Capital*). Therefore, in the first regression model, the dependent variables were regressed considering only the control variables. The second regression model adds the direct effect of the independent variable "*SUST*". The final model adds the interaction effects between the independent variable "*SUST*" and the standardized moderation variable "*UpstreamSupport*." Implemented through the sust##c.upstreamsupport command.

4.3.1 Independent Venture Capital

The first regression was performed considering *nIndependent Venture Capital* as the dependent variable and the control variables reported earlier. The poisson command was carried out and then the estat gof test wasperformed, resulting in the following pattern:

Deviance goodness-of-fit = 659.0116

Prob > chi2(553) = 0.0012

Pearson goodness-of-fit = 705.5759

Prob > chi2(553) = 0.0000

It can be seen from the result of this test that the command to be used is nbreg for Model 1. Since the test is statistically significant, therefore the data do not fit the poisson's model.

	MODEL 1						
nIndependent Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
usa	.233	.107	2.18	.029	.024	.443	**
europe	-.164	.123	-1.33	.184	-.405	.078	
asia	-.211	.128	-1.65	.1	-.463	.04	*
year	.041	.013	3.19	.001	.016	.066	***
age	-.054	.018	-3.01	.003	-.089	-.019	***
rounds	.17	.046	3.73	0	.081	.259	***
size	.085	.022	3.85	0	.042	.129	***
grant	-2.601	.395	-6.58	0	-3.376	-1.826	***
seed	-.664	.192	-3.47	.001	-1.039	-.288	***
earlystageventure	-.58	.209	-2.78	.005	-.989	-.17	***
ventureround	-.826	.222	-3.71	0	-1.262	-.39	***
corporateround	-1.638	.44	-3.72	0	-2.501	-.776	***
latestageventure	-.624	.25	-2.49	.013	-1.115	-.133	**
otherinvestments	-.933	.236	-3.95	0	-1.396	-.47	***
lnmoneyraised	.046	.014	3.24	.001	.018	.074	***
lnpatentsgranted	-.058	.029	-2.01	.045	-.114	-.001	**
Constant	-81.549	25.67	-3.18	.001	-131.861	-31.236	***
Constant	-2.956	.509	.b	.b	-3.953	-1.958	

Mean dependent var	2.057	SD dependent var	1.838
Pseudo r-squared	0.101	Number of obs	565
Chi-square	206.587	Prob > chi2	0.000
Akaike crit. (AIC)	1881.760	Bayesian crit. (BIC)	1959.823

*** p<.01, ** p<.05, * p<.1

USA / Europe: We can notice that USA has a strong positive influence on Independent Venture Capital investment (p-value=0.24, β=+0.233), while Europe does not inlfuence (p-value>0.1). However studies show that startups in USA and in Europe are more likely to attract investment from Independent Venture Capitals than in other countries due to more developed market, mature entrepreneurial ecosystem, entrenched entrepreneurial culture, available capital, and greater edge on the development of technological innovation (Ooghe et al., 1989; Shuwaikh et al., 2022; Bocken, 2015). *Asia*: Although the variable slightly negatively affect Independent Venture Capital investments (p-value=0.1), it has been added to the analysis as, as reported in the literature, it's distinguished from other countries by its vast geographical, cultural, economic and regulatory diversity. This diversity creates unique opportunities and challenges for Independent Venture Capital in emerging and growing markets, characterized by technological innovation and broad consumer markets (Groh et al., 2018). *Year / Age:* The *year* variable positively influences Independent Venture Capital investments. The year in which a VC made an investment is crucial because it affects the initial investment opportunity. Technologies and market trends change rapidly, and investing in a company at a time when a new technology or trend is emerging can lead to a significant return on investment. *Age* negatively affects Independent Venture Capital investments. Younger startups may have higher growth potential but also higher risk. Older companies may offer more stability, but they may have fewer opportunities for explosive growth.

Rounds and *size*: They have a significant influence as they have a p-value<0.1 and a positive β, in fact more funding rounds and the larger size a startup has received, the more they attract Independent Venture Capitals investment. These startups, having a high number of employees, are more stable, offer greater visibility, have demonstrated greater resilience, have a lower risk of failure, can scale quickly, offer more attractive exit opportunities, and enable portfolio diversification (Bertoni et al., 2015; Dushnitsky & Shapira, 2010; Mrkajic et al., 2019). *Seed*/*early stage venture*/*venture round*: Despite Independent Venture Capitals show strong negative interest in *seed*, *early stage venture* and *venture round*, all three rounds are crucial for Independent Venture Capitals. Because, as reported in the literature, they give them early access to innovations and emerging technologies, allowing them to identify promising trends and market opportunities early. In addition, they can have more direct strategic involvement, helping to shape business strategy with lower risks (Bianchini & Croce, 2022; Dushnitsky & Shapira, 2010; G. Murray, 1999).

Corporate round/late stage venture/other investments/grant: All of these investment rounds have a negative impact on Independent Venture Capital investments as their p-value<0.1 and β is negative. The participation of large corporations in these rounds can limit the independence of startups, generate conflicts of interest, restrictions, and complications in governance. This may conflict with the goals and strategic flexibility desired by Independent Venture Capitals and startup founders. Therefore, although they can bring resources and opportunities, these rounds can also involve restrictions and interference that negatively affect Independent Venture Capitals' investments (Hegeman & Sørheim, 2021; Rossi etal., 2020).

Patents granted: It has a negative impact on Independent Venture Capitals investment for several reasons (p-value of 0.045 and β= -0.58). First, well-defended patents can create legal constraints that limit the operational flexibility of startups and result in significant legal costs. Second, the threat of patent-related litigation can pose a financial and operational re-risk for startups, discouraging Independent Venture Capitals from investing (Bertoni et al., 2010; Munari & Toschi, 2015; Zhou et al., 2016).

Moneyraised: This variable affect positively Independent Venture Capital investments, it was included in the analysis because, as reported in the literature, it represents a company's ability to finance growth, execute the business plan, mitigate risk, compete effectively and influence its assessment, as reported in the literature. This gives Independent Venture Capitals a clear indication of a company's financial resources and potential for success (Davila et al., 2000; Nanda & Rhodes-Kropf, 2013).

In the second regression the independent variable *SUST* is added.

MC DEL 2							
nIndependent Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
sust	-.032	.124	-0.26	.794	-.276	.211	
usa	.234	.107	2.19	.029	.025	.444	**
europe	-.163	.123	-1.33	.184	-.405	.078	
asia	-.213	.128	-1.66	.097	-.465	.039	*
year	.04	.013	3.10	.002	.015	.065	***
age	-.053	.018	-2.91	.004	-.089	-.017	***
rounds	.17	.046	3.73	0	.081	.26	***
size	.086	.022	3.86	0	.042	.129	***
grant	-2.594	.396	-6.55	0	-3.37	-1.818	***
seed	-.663	.191	-3.46	.001	-1.038	-.287	***
earlystageventure	-.579	.209	-2.78	.005	-.988	-.17	***
ventureround	-.826	.222	-3.72	0	-1.262	-.391	***
corporateround	-1.636	.44	-3.72	0	-2.498	-.774	***
latestageventure	-.627	.25	-2.50	.012	-1.118	-.136	**
otherinvestments	-.931	.236	-3.94	0	-1.394	-.468	***
lnmoneyraised	.046	.014	3.22	.001	.018	.074	***
lnpatentsgranted	-.058	.029	-2.00	.045	-.114	-.001	**
Constant	-80.429	26.022	-3.09	.002	-131.43	-29.427	***
Constant	-2.959	.51	.b	.b	-3.959	-1.958	
Mean dependent var		2.057	SD dependent var			1.838	
Pseudo r-squared		0.101	Number of obs			565	
Chi-square		206.656	Prob > chi2			0.000	

Akaike crit. (AIC)	1883.691	Bayesian crit. (BIC)	1966.091

*** p<.01, ** p<.05, * p<.1

The control variables always have the same influence as that reported in the Model 1.

SUST: This variable does not influence the investments of Independent Venture Capitals (p-value=0.794). This may be due to several reasons, first Independent Venture Capitals are often oriented toward short-term financial returns and may be reluctant to engage in sustainable investments that require higher initial costs or a longer time period to generate significant returns. Investments in sustainability can also lead to higher market risks, especially if startups operate in highly competitive or rapidly changing regulatory sectors. In fact they could be oriented to different investment approaches,which do not necessarily reflect a strong influence of sustainability. Variability in the sample of startups analyzed could affect the statistical significance of sustainability (Bendig et al., 2022; Bianchini & Croce, 2022; Bocken, 2015).

In the following regression another term was added corresponding to the product between *sust* and standardized *upstreamsupport*, through the sust##c.upstreamsupport command.

			MODEL 3				
nIndependent Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
upstreamsupport	.12	.037	3.28	.001	.048	.192	***
sust#upstreamsupport	-.129	.155	-0.83	.406	-.433	.175	
sust	.23	.499	0.46	.644	-.747	1.208	
usa	.053	.13	0.41	.68	-.201	.308	
europe	-.373	.152	-2.46	.014	-.671	-.076	**
asia	-.119	.154	-0.77	.438	-.421	.183	
year	.004	.016	0.25	.803	-.028	.036	
age	-.028	.023	-1.24	.216	-.072	.016	
rounds	.172	.058	2.99	.003	.059	.285	***
size	.122	.026	4.64	0	.071	.174	***
grant	-2.499	.451	-5.54	0	-3.382	-1.615	***
seed	-.527	.203	-2.59	.01	-.926	-.128	***
earlystageventure	-.549	.225	-2.44	.015	-.99	-.109	**
ventureround	-.644	.243	-2.65	.008	-1.12	-.167	***
corporateround	-1.498	.508	-2.95	.003	-2.494	-.502	***
latestageventure	-.511	.278	-1.84	.066	-1.055	.033	*
otherinvestments	-.764	.255	-2.99	.003	-1.264	-.264	***
lnmoneyraised	.028	.015	1.84	.066	-.002	.058	*
lnpatentsgranted	-.058	.032	-1.80	.072	-.121	.005	*
Constant	-8.061	32.947	-0.24	.807	-72.635	56.513	
Constant	-3.455	.908	.b	.b	-5.235	-1.675	
Mean dependent var		1.913	SD dependent var			1.686	
Pseudo r-squared		0.098	Number of obs			438	
Chi-square		149.329	Prob > chi2			0.000	
Akaike crit. (AIC)		1416.012	Bayesian crit. (BIC)			1501.739	

*** p<.01, ** p<.05, * p<.1

SUST: It does not influence investment by Independent Venture Capitals, as explained in the Model 2. *Upstream Support*: This variable has a strong positive influence, as it has a p-value of 0.001and a positive β. Upstream support policies, such as low-carbon R&D expenditures, can be financial and tax incentives for startups, this increases their attractiveness to Independent Venture Capitals. In addition,

these policies may create market opportunities and increased demand for startups. Finally, startups that benefit from supportive upstream policies could be less risky in terms of regulatory and environmental compliance (Bianchini & Croce, 2022; Cojoianu et al., 2020; Criscuolo & Menon, 2015; Polzin, 2017).

The interaction between the SUST variable and the moderation variable Upstream Support does not affect Independent Venture Capitals' investments, so the Upstream support variable does not affect Independent Venture Capitals' investments in sustainable startups (Cojoianu et al., 2020; Criscuolo & Menon, 2015).

4.3.2 Corporate Venture Capital

The first regression for the dependent variable *nCorporate Venture Capital* was performed considering the control variables reported before. The poisson command was carried out and then the estat gof test wasperformed, resulting in the following pattern:

Deviance goodness-of-fit = 318.2806

Prob > chi2(556) = 1.0000

Pearson goodness-of-fit = 567.5421

Prob > chi2(556) = 0.2731

The result of this test shows since the chi-square goodness-of-fit test is not statistically significant, the model fits reasonably well with poisson regression, but the nbreg command can also be used. Another test is the probability ratio test.

/lnalpha	-2.098888	2.262421	-6.533151	2.335375
alpha	.1225927	.2773563	.0014544	10.33334

Likelihood-ratio test of alpha=0: chibar2(01) = 0.23 Prob>=chibar2 = 0.316

Figure 24: likelihood ratio test

Since in Figure 24 we can notice thath α = 0.122, notwithstanding it is a value very close to 0, it suggests very low overdispersion. And since nbreg is a generalization of poisson, so it gives the same results, the nbreg command can also be used.

MC DEL 4							
nCorporate Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
usa	.459	.419	1.09	.274	-.363	1.281	
europe	.063	.481	0.13	.896	-.879	1.005	
asia	.051	.481	0.11	.916	-.892	.993	
year	.017	.048	0.36	.719	-.077	.112	
age	-.023	.058	-0.39	.696	-.137	.092	
rounds	.1	.147	0.68	.497	-.188	.388	
size	.098	.072	1.37	.097	-.043	.239	*
grant	-1.582	.907	-1.74	.081	-3.36	.195	*
seed	-1.561	.673	-2.32	.02	-2.879	-.242	**
earlystageventure	-.982	.687	-1.43	.153	-2.329	.364	
ventureround	-.739	.718	-1.03	.303	-2.145	.668	
corporateround	1.141	.765	1.49	.096	-.358	2.64	*
latestageventure	-.348	.763	-0.46	.648	-1.844	1.147	

otherinvestments	-.762	.758	-1.00	.315	-2.248	.725	
lnmoneyraised	.07	.048	1.46	.145	-.024	.164	
lnpatentsgranted	.174	.071	2.44	.015	.034	.314	**
Constant	-37.673	97.136	-0.39	.698	-228.057	152.711	
Constant	-2.099	2.262	.b	.b	-6.533	2.335	
Mean dependent var		0.173	SD dependent var			0.471	
Pseudo r-squared		0.118	Number of obs			565	
Chi-square		65.297	Prob > chi2			0.000	
Akaike crit. (AIC)		525.438	Bayesian crit. (BIC)			603.501	

*** p<.01, ** p<.05, * p<.1

USA/Europe/Asia: Although these variables are not significant, according to the literature they are fundamental for various reasons: the ecosystem of advanced and diversified startups, the attraction of global talent, the large diversified market and the environment conducive to investment. Entrepreneurial culture fosters innovation, while easy access to capital and stimulating competition create unique opportunities (Battisti et al., 2022; Belderbos et al., 2018; Ooghe et al., 1989).

Year/Age: They don't affect Corporate Venture Capital investments. The year in which a VC made an investment, on the other hand, is critical since it influences the first investment opportunity. Technologies and market trends change quickly, and investing in a firm at the onset of a new technology or trend can result in a high return on investment. Furthermore, younger businessesmay have greater growth potential but also greater risk. Older businesses may be more stable, but they may also have less prospects for dramatic expansion.

Size/rounds: Startup size has a positive influence on Corporate Venture Capital (p-value=0.097 and a β +0.098),but the rounds have no influence. As reported in the literature, larger startups and many roundsare attractive to Corporate Venture Capitals: they have higher growth potential, lower risk of failure, established access to markets, better ability to compete with established companies, and contribute to Corporate Venture Capital portfolio diversification (Battisti et al., 2022; De Lange & Valliere, 2020).

Corporate round/ late stage venture: The analysis reveals that "*Corporate Round*" has a slight positive influence on Corporate Venture Capital investment (p-value of 0.96 and positive β). On the other hand, "*Late-Stage Venture*" does not show the same positive impact, as it presents a p-value of 0.22. These two variables were included in the analysis because, as reported in the literature, these rounds provide Corporate Venture Capitals with more robust and strategically aligned investment opportunities to their strategies with those of their parent companies, accessing resources and expertise, reducing risk, creating business synergies and obtaining ongoing financial support (Gompers & Lerner, 2001; Hegeman & Sørheim, 2021; P. M. Lee et al., 2011). *Seed/grant*: They have a negative influence on investment by Corporate Venture Capitals (p-value=0.02 and p- value=0.081 and negative β). This can be due to the divergences of the rounds with the

objectives of the main company, also because of the risks associated with early-stage startups and high level of uncertainty (Bianchini & Croce, 2022; Dushnitsky & Shapira, 2010; Hegeman & Sørheim, 2021). *Early stage venture/venture round/ other investments*: The analysis reveals that these variables not influence Corporate Venture Capital investment (p-value>0.1). Although some of these variables are not closely related to investment by Corporate Venture Capitals, they were included in the analysis to perform a comparison with other investment rounds. Also because, as reported in the literature, they offeraccess to innovative technologies, opportunities for strategic partnerships and growth potential (Bianchini & Croce, 2022; Dushnitsky & Shapira, 2010; Hegeman & Sørheim, 2021). *Patents granted:* It positively influence Corporate Venture Capital investments (p-value of 0.015 and positive β) because they provide legal protection to innovations, differentiate startups from competitors, may have commercial value through licensing or sales, incentivize continued innovation, and make companies more attractive for M&A. These factors make startups with strong patent basemore attractive (Bertoni et al., 2010; Munari & Toschi, 2015; Zhou et al., 2016). *Money Raised*: The variable "*Money Raised*," although it does not influence investment byCorporate Venture Capitals, was included in the analysis because, as reported in the literature, it's a signal of investor and market confidence, indicates a startup's growth potential and financial strength. These factors positively influence Corporate Venture Capitals' decision to invest in a startup with opportunities that offer significant return potential (Davila et al., 2000; Nanda & Rhodes-Kropf, 2013).A subsequent regression was performed, adding the independent variable SUST.

MODEL 5							
nCorporate Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
sust	.557	.33	1.69	.092	-.09	1.203	*
usa	.47	.417	1.13	.26	-.348	1.288	
europe	.092	.48	0.19	.849	-.849	1.032	
asia	.093	.483	0.19	.847	-.852	1.039	
year	.026	.048	0.54	.592	-.068	.12	
age	-.034	.059	-0.59	.557	-.149	.08	
rounds	.092	.147	0.62	.533	-.197	.38	
size	.099	.072	1.38	.099	-.041	.24	*
grant	-1.719	.919	-1.87	.062	-3.521	.083	*
seed	-1.57	.682	-2.30	.021	-2.907	-.233	**
earlystageventure	-.977	.699	-1.40	.162	-2.347	.393	
ventureround	-.712	.729	-0.98	.329	-2.141	.717	
corporateround	1.129	.778	1.45	.098	-.397	2.654	*
latestageventure	-.291	.775	-0.38	.707	-1.81	1.227	
otherinvestments	-.787	.768	-1.02	.306	-2.291	.718	
lnmoneyraised	.073	.048	1.51	.131	-.022	.168	
lnpatentsgranted	.179	.071	2.53	.012	.04	.317	**
Constant	-54.687	96.772	-0.57	.572	-244.357	134.983	
Constant	-2.244	2.503	.b	.b	-7.149	2.661	
Mean dependent var		0.173	SD dependent var			0.471	
Pseudo r-squared		0.122	Number of obs			565	
Chi-square		67.851	Prob > chi2			0.000	

Akaike crit. (AIC)	524.884	Bayesian crit. (BIC)	607.283

*** p<.01, ** p<.05, * p<.1

The control variables always have the same influence as that reported in the Model 4.

SUST: Sustainability slightly positively influence Corporate Venture Capital investments, but often has a limitedimpact due to Corporate Venture Capital's primary financial priorities, return on investment expectations, and the dynamic specifics of parent companies. Corporate Venture Capitals tend to reflect the priorities of their parent companies, and sustainable startups can have several advantages: market opportunities, alignment with business priorities, improved reputation, promotion of innovation, risk reduction and regulatory compliance. These factors make sustainable investment attractive forCorporate Venture Capitals (Bendig et al., 2022; Battisti et al.,2022; Bocken, 2015).

In the following regression another term was added corresponding to the product between *sust* and standardized *upstreamsupport*, through the sust##c.upstreamsupport command.

MC DEL 6							
nCorporate Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
upstreamsupport	-.042	.136	-0.31	.758	-.309	.225	
sust#upstreamsupport	.427	.418	1.02	.307	-.392	1.245	
sust	-1.005	1.526	-0.66	.51	-3.996	1.987	
usa	.737	.568	1.30	.194	-.376	1.849	
europe	.241	.641	0.38	.707	-1.016	1.498	
asia	.259	.622	0.42	.678	-.961	1.478	
year	.008	.063	0.13	.899	-.116	.132	
age	-.092	.077	-1.20	.229	-.243	.058	
rounds	-.074	.208	-0.36	.722	-.481	.334	
size	.075	.092	0.81	.416	-.105	.254	
grant	-1.492	.946	-1.58	.115	-3.347	.363	
seed	-1.509	.711	-2.12	.034	-2.903	-.115	**
earlystageventure	-1.341	.754	-1.78	.075	-2.82	.137	*
ventureround	-.685	.8	-0.86	.392	-2.252	.882	
corporateround	1.389	.825	1.68	.092	-.227	3.005	*
latestageventure	-.353	.865	-0.41	.683	-2.049	1.342	
otherinvestments	-.476	.813	-0.59	.558	-2.069	1.117	
lnmoneyraised	.11	.053	2.08	.038	.006	.214	**
lnpatentsgranted	.165	.088	1.87	.061	-.007	.338	*
Constant	-19.052	126.976	-0.15	.881	-267.92	229.816	
Constant	-14.715	1209.104	.b	.b	-2384.514	2355.085	
Mean dependent var		0.158	SD dependent var			0.439	
Pseudo r-squared		0.131	Number of obs			438	
Chi-square		52.962	Prob > chi2			0.000	
Akaike crit. (AIC)		392.408	Bayesian crit. (BIC)			478.134	

*** p<.01, ** p<.05, * p<.1

SUST: It not influence investment by Corporate Venture Capitals (p-value=0.51) because the priority of parent companies, the nature of investment sectors, the complexity of measuring environmental impact, financial return requirements, and other considerations may affect the relevance of sustainability in Corporate Venture Capital investments. However, some exceptions may exist depending on the specific priorities and strategies of each Corporate Venture Capital (Battisti et al., 2022; Bianchini & Croce, 2022).

Upstream Support: This variable not influence investments by Corporate Venture Capitals because it may not fully align with Corporate Venture Capitals' priorities and strategies. These investors tend to look for investment opportunities that create direct synergies with the parent company's core activities and have a direct strategic impact. In addition, complexity in measuring impact and different sector dynamics may contribute to Upstream Support's lack of significant influence on Corporate Venture Capital investments (Bianchini & Croce, 2022; Kruse et al., 2022). The interaction between the *SUST* variable and the moderation variable *Upstream Support* does not affect Corporate Venture Capitals' investments, so the *Upstream support* variable does not affect Corporate Venture Capitals' investments in sustainable startups (Cojoianu et al., 2020; Criscuolo & Menon, 2015).

4.3.3 Government Venture Capital

The first regression for the dependent variable *nGovernment Venture Capital* was performed considering the control variables. The poisson command was carried out and then the estat gof test was performed, resulting in the following pattern:

Deviance goodness-of-fit = 225.0535

Prob > chi2(523) = 1.0000

Pearson goodness-of-fit = 481.1245

Prob > chi2(523) = 0.9816

The result of this test shows since the chi-square goodness-of-fit test is not statistically significant, the model fits reasonably well with poisson regression, but the nbreg command can also be used. Another test is the probability ratio test.

/lnalpha	-15.05987	700.0781	-1387.188	1357.068
alpha	2.88e-07	.0002017	0	.

Figure 25: likelihood ratio test

Since in Figure 25 we can notice that α = 2.88e-07, notwithstanding it is a value very close to 0, it suggests very very low overdispersion. And since nbreg is a generalization of poisson, so it gives the same results, the nbreg command can also be used.

MODEL 7							
nGovernment Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
usa	-.698	.352	-1.98	.047	-1.387	-.008	**
europe	-.442	.373	-1.18	.236	-1.173	.289	
asia	-1.073	.554	-1.94	.053	-2.157	.012	*
year	-.03	.05	-0.61	.542	-.127	.067	
age	.051	.063	0.81	.415	-.072	.175	
rounds	.597	.146	4.09	0	.311	.882	***
size	-.162	.11	-1.48	.139	-.377	.052	
grant	.97	.602	1.61	.087	-.21	2.151	*
seed	-1.2	.665	-1.80	.071	-2.503	.103	*
earlystageventure	-1.081	.729	-1.48	.138	-2.509	.347	

ventureround	-.94	.755	-1.25	.213	-2.419	.539	
corporateround	-20.717	21014.958	-0.00	.999	-41209.278	41167.843	
latestageventure	-1.767	1.255	-1.41	.159	-4.226	.692	
otherinvestments	-1.216	.794	-1.53	.126	-2.772	.34	
lnmoneyraised	-.024	.05	-0.47	.095	-.121	.074	*
lnpatentsgranted	.099	.117	0.85	.398	-.13	.328	
Constant	59.776	99.703	0.60	.549	-135.638	255.19	
Constant	-15.06	700.078	.b	.b	-1387.188	1357.068	

Mean dependent var	0.136	SD dependent var	0.373
Pseudo r-squared	0.210	Number of obs	565
Chi-square	98.393	Prob > chi2	0.000
Akaike crit. (AIC)	406.736	Bayesian crit. (BIC)	484.799

**** p<.01, ** p<.05, * p<.1*

USA/Asia/Europe: *Europe* does not affect Government Venture Capital investments, but *USA* and *Asia* negative statistical significance of the *USA* and *Asia* variables (p-value=0.04 and p-value=0.05 with negative β) regarding Government Venture Capital investments may be due to various reasons. These include restrictive policies, regional factors, political or economic instability, concerns about intellectual property protection, perceived excessive competitiveness, currency and geopoliticalrisks (Groh et al., 2018; Shuwaikh et al., 2022).

Year/Age: They have no impact on Government Venture Capital investments. The year a VC made an investment, on the other hand, is significant since it determines the initial investment opportunity. Technologies and market trends change rapidly, and investing in a company at the beginning of a new technology or trend can result in a significant return on investment. Furthermore, while younger enterprises may have higher development potential, they may also be more risky. Older firms may be more stable, but they may also have less opportunities for rapid growth. *Rounds / size*: Despite the variable *size* have no influence (p-values > 0.1), the variable *rounds* has a positive influence of the variable on Government Venture Capital investments, it indicates that the higher is the rounds number, the more Government Venture Capitals invest. This relationship could be due to investment progression, demonstration of confidence in the market, capacity for growth, reduced uncertainty, and investment structure. *Size* can be considered as relevant factors for understanding the overall picture, as explained in the literature, because is correlated with its ability to attract outside funds or with its maturity (Bianchini & Croce, 2022). *Grant/Seed*: The positive influence of grant on Government Venture Capitals' investments indicates that there is a positive relationship between the receipt of grants or government funding and Government Venture Capitals' investments. This could be because grants provide additional capital that makes investment more attractive to Government Venture Capitals. In addition, grants can be seen as a sign of government support and confidence in the future success of the enterprise.

Earlystageventure/ corporateround / ventureround / latestageventure / otherinvestments: Despite these variables not influence Government Venture Capital investment (p-value>0.1), are an important factors in the analysis, as explained in the literature and also they were included in the analysis to perform a comparison with other investment rounds (Gompers & Lerner, 2001; Hegeman & Sørheim, 2021).

Patents granted: Despite the non-influence of *lnpatentsgranted* on Government Venture Capitals investment (p- value=0.11), it is an important factor in the analysis, as explained in the literature. Because, thenumber of patents acquired, helps identify investment opportunities aligned with Government Venture Capitals' goals of promoting innovation, economic growth, and competitiveness in the advanced technology sector (Munari & Toschi, 2015; Zhou et al., 2016).

Money raised: The negative influence on Government Venture Capital investment, could be due to the stage of company development, the risk of failure associated with excessive financing and the structureof investment. It has been added to the analysis as, as reported in the literature, it's an importantfactor for Government Venture Capitals (Davila et al., 2000; Nanda & Rhodes-Kropf, 2013).

A subsequent regression was performed, adding the independent variable SUST.

MODEL 8

nGovernment Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
sust	.767	.28	2.74	.006	.218	1.317	***
usa	-.598	.357	-1.67	.094	-1.298	.103	*
europe	-.385	.381	-1.01	.312	-1.131	.361	
asia	-.993	.561	-1.77	.077	-2.092	.106	*
year	-.023	.049	-0.46	.643	-.119	.074	
age	.021	.065	0.32	.752	-.107	.149	
rounds	.585	.146	4.00	0	.299	.872	***
size	-.147	.109	-1.35	.177	-.361	.067	
grant	.83	.64	1.30	.091	-.424	2.085	*
seed	-1.212	.694	-1.74	.081	-2.573	.149	*
earlystageventure	-1.067	.765	-1.39	.163	-2.567	.432	
ventureround	-.836	.789	-1.06	.289	-2.383	.71	
corporateround	-26.435	375738.63	-0.00	1	-736460.61	736407.75	
latestageventure	-1.585	1.281	-1.24	.216	-4.096	.926	
otherinvestments	-1.217	.825	-1.47	.14	-2.834	.4	
lnmoneyraised	-.02	.052	-0.39	.093	-.122	.081	*
lnpatentsgranted	.05	.123	0.41	.683	-.19	.29	
Constant	44.826	99.198	0.45	.651	-149.598	239.251	
Constant	-15.43	744.224	.b	.b	-1474.082	1443.221	

Mean dependent var	0.136	SD dependent var	0.373
Pseudo r-squared	0.224	Number of obs	565
Chi-square	105.231	Prob > chi2	0.000
Akaike crit. (AIC)	401.897	Bayesian crit. (BIC)	484.297

**** p<.01, ** p<.05, * p<.1*

The control variables always have the same influence as that reported in the Model 7.

SUST: The strong positive influence of the variable "*sust*" on Government Venture Capital investments indicates that Government Venture Capitals invest more in sustainable startups. Because, working towards the direction of the projects proposed by the government, they prefer to invest in startups that have their own interest as a priority, therefore interest in the environmental impact, international sustainable development goals and government policies that promote sustainability (Bendig et al., 2022; Bianchini & Croce, 2022).

In the following regression, another term was added corresponding to the product between *sust* and standardized *upstreamsupport*, through the sust##c.upstreamsupport command.

MODEL 9

nGovernment Venture Capital	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
upstreamsupport	-.04	.147	-0.27	.785	-.329	.249	
sust#upstreamsupport	.118	.286	0.41	.681	-.443	.678	
sust	.634	1.037	0.61	.071	-1.399	2.667	*
usa	-.564	.444	-1.27	.203	-1.434	.305	
europe	-.336	.473	-0.71	.478	-1.263	.592	
asia	-1.101	.83	-1.33	.185	-2.728	.525	
year	-.072	.062	-1.15	.249	-.195	.05	
age	-.058	.092	-0.63	.531	-.239	.123	
rounds	.581	.183	3.17	.002	.222	.94	***
size	-.334	.146	-2.28	.023	-.621	-.047	**
grant	.823	.76	1.08	.279	-.667	2.313	
seed	-1.132	.807	-1.40	.161	-2.715	.45	
earlystageventure	-1.301	.923	-1.41	.159	-3.11	.508	
ventureround	-.819	.952	-0.86	.39	-2.684	1.046	
corporateround	-27.033	637844.49	-0.00	1	-1250179.3	1250125.2	
latestageventure	-.994	1.396	-0.71	.476	-3.729	1.741	
otherinvestments	-1.078	.945	-1.14	.254	-2.93	.773	
lnmoneyraised	.034	.063	0.54	.589	-.09	.158	
lnpatentsgranted	.166	.139	1.20	.23	-.105	.438	
Constant	143.954	125.672	1.15	.252	-102.357	390.266	
Constant	-15.629	802.973	.b	.b	-1589.426	1558.169	

Mean dependent var	0.137	SD dependent var	0.376
Pseudo r-squared	0.263	Number of obs	438
Chi-square	96.100	Prob > chi2	0.000
Akaike crit. (AIC)	311.177	Bayesian crit. (BIC)	396.903

*** *p<.01*, ** *p<.05*, * *p<.1*

SUST: It has the same influence as Model 8 so the conclusions have not varied.

Upstream Support: This variable not influence investments by Government Venture Capitals because it may not fully align with their priorities and strategies. This could be also due to the lack of synergies between "*Upstream Support*" activities and Government Venture Capital investment opportunities, or the prioritization of other investment opportunities considered more promising (Botta & Kozluk, 2014; Kruse et al., 2022). The interaction between the *SUST* variable and the moderation variable *Upstream Support* does not affect Government Venture Capitals' investments, so the *Upstream support* variable does not affect their investments in sustainable startups (Cojoianu et al., 2020; Criscuolo & Menon, 2015).

5. CONCLUSION

Sustainability is a major global challenge but also an opportunity for positive change. It addresses pressing issues such as climate change and pollution while providing economic opportunities and improvements for the planet and future generations. Therefore, businesses are recognizing their environmental responsibility by adopting sustainable practices. This approach not only fosters better consumer perception, but can also lead to competitive advantages and customer loyalty, attracting investors, reducing operating costs, and entering new markets. Investing in sustainability is crucial to ensuring a better future for present and future generations.

This commitment is in line with the recommendations of United Nations conferences on sustainability, such as the COP, which promote concrete actions through the SDGs to address environmental and economic issues. In addition, investments in sustainable startups fuel open innovation, enabling the development of sustainable technologies and strategies, encouraging a transition to a greener and more resilient economy. Incentives and public policies play a key role in supporting these startups, because they reduce risk, provide tax benefits, financing and support for sustainable businesses, making investment more attractive.

In this study, therefore, we focused on what are the success factors of sustainable startups, with the aim of analyzing the number of investments by VCs toward sustainable startups. In addition, this study aims to make an empirical contribution to the scientific literature by including in the analysis the EPS Index, which is a term used to assess how strict and restrictive government policies or environmental regulations are in a given country.

This analysis was carried out by starting with the creation of a dataset including 368 start-ups, considering the investments received 2010 and 2022. As a result of the analysis performed, it can be concluded that sustainability does not influences on the number of Independent Venture Capitals investment (p-value=0.794). In contrast it has a positive influence on Corporate Venture Capitals and Government Venture Capitals investments (p- value=0.92 and p-value=0.06). From the p-value we can assume that the shift of startups towards sustainability, attracts much more Government Venture Capitals than Corporate Venture Capitals. Thus, the results show that the influence of sustainability on investment depends on the type of VC under analysis. All results are supported by literature (Bianchini & Croce, 2022; Bocken et al., 2015), according to which Independent Venture Capitals invest only in the most promising companies because their main needis to generate an immediate financial return, as opposed to longer development deadlines and limited investment opportunities for sustainable startups. While Government Venture Capitals invest in more mature cleantech enterprises that are not able to move beyond the "valley of death" stage, because they

work toward the direction of the government's proposed projects, thus toward environmental protection, so they prefer to invest in startups that have their own interest as their priority. In addition, for Corporate Venture Capitals, the priority of their investments is to align themselves with the strategic objectives of the parent companies and sustainable startups could meet this condition. In addition to aligning with business priorities, sustainable startups bring several benefits: marketopportunities, improved reputation, long-term growth potential, and regulatory compliance. These factors make sustainable investment attractive for Corporate Venture Capitals (Battisti er al, 2022; Bending etal, 2022). Regarding the moderating effect of Upstream Support Policies, the results show that it hasa positive effect on investments made by Independent Venture Capitals, so they invest more in startups in the presenceof this policy. While for Corporate Venture Capitals and Government Venture Capitals the policy has no influence. This on the one hand confirms the literature (Bianchini & Croce, 2022; Bocken et al.,2015), because Government Venture Capital investments are alternatives to R&D subsidies. As governments allocate resources to clean technologies directly through Government Venture Capital funds or indirectly through R&D support. As for Independent Venture Capitals, the literature argues that Upstream Support increases the likelihood of support from Independent Venture Capitals, so it is consistent with the results, but governments need to design a balanced set of policies that maximize the Independent Venture Capital response, as investing in upstream support worsens the public budget. In contrast, the strategic orientation of Corporate Venture Capitals toward more immediate investment opportunities aligned with the parent company, with the financial goal of quick returns, diverges from the long timeframes of R&D policy impact (Battisti et al.,2022; Bending et al., 2022). Moreover, in all three cases upstream support does not influence on VCs investments toward sustainable startups. This was quite predictable since in the case of Government Venture Capitals and Corporate Venture Capitals, they are already influenced by sustainability so they do not need the extra incentive. Instead, Independent Venture Capitals are influenced by upstream support only for general startups and not for sustainable startups, as they invest in those countries where these incentives are greater, but startups are not necessarily sustainable. This is because they prefer to invest in startups that could lead to sustainability in the long term because there are fewer challenges and risks than investing directly in sustainable startups. Investing in sustainability may require a more targeted approach, specific expertise, a more detailed assessment of environmental and social impact, and may involve risks and different paybacks than more generic R&D opportunities, which may be more attractive to investors.

investment. While environmental policies have positive effect on Independent Venture Capitals and no effect on Corporate Venture Capitalsand Government Venture Capitals. This shows that although sustainability is an increasingly important factor, sustainable entrepreneurship is still in its infancy, and investors do not always feel ready to face the challenges of sustainability.

4.1 Limitations

The limitations of this study relate to the construction of the dataset. In fact, it features only 368 startups of which 24 are classified as sustainable (6,5% of the sample). This is due to the lack of information regarding investments for all the startups in the original dataset. As a matter of fact, some of the startups in the dataset did not receive any investment, while in other cases the number and names of the investors could not be found. Another problem with the sample is the missing data for the moderator variable *Upstream support*, as the dataset has a time series from 2010 to 2020, consequently, values for *upstream support* for the years 2021 and 2022 are not present in the full dataset. Moreover, the recurring problem of missing data is also present for other variables, e.g., *estimated revenue range, ipo, m&a, acquisition price, ipo money raised, cumulated pil*. For these variables in some cases it was difficult to find the values, in other cases they presented in most observations the value 0.

For future studies, it would be important to be able to get more information about investors and find information about the EPS index for the years 2021 and 2022.

6. BIBLIOGRAPHY

Adamczyk, M., Betlej, A., Gondek, J., & Ohotina, A. (2019). Technology and sustainable development: Towards the future? *Entrepreneurship and Sustainability Issues*, *6*(4), 2003–2016. https://doi.org/10.9770/jesi.2019.6.4(32)

Adams, A. (2013). Sustainability-oriented innovation: a systematic review A NOTE ON VERSIONS. *ORE Open Research Exeter*. http://hdl.handle.net/10871/14285

Alperovych Y, Groh A, & Quas A. (2020). Bridging the equity gap for young innovative companies: The design of effective government venture capital fund programs. *Emlyon Business School, France, University of Milan, Italy*. https://www.elsevier.com/open-access/userlicense/1.0/

Antarciuc, E., Zhu, Q., Almarri, J., Zhao, S., Feng, Y., & Agyemang, M. (2018). Sustainable venture capital investments: An enabler investigation. *Sustainability (Switzerland)*, *10*(4). https://doi.org/10.3390/su10041204

Asheim, G. B., Hansen, M. D., & Klepacka, T. (2018). Sustainable startups as drivers of green innovation. *Sustainability*, *10*(8), 2800.

Attia, A. (2023). Effect of Sustainable Supply Chain Management and Customer Relationship Management on Organizational Performance in the Context of the Egyptian Textile Industry. *Sustainability (Switzerland)*, *15*(5). https://doi.org/10.3390/su15054072

Bacq, S., & Janssen, F. (2011). The multiple faces of social entrepreneurship: A review of definitional issues based on geographical and thematic criteria. *Entrepreneurship and Regional Development*, *23*(5–6), 373–403. https://doi.org/10.1080/08985626.2011.577242

Battisti, E., Nirino, N., Leonidou, E., & Thrassou, A. (2022). Corporate venture capital and CSR performance: An extended resource based view's perspective. *Journal of Business Research*, *139*, 1058–1066. https://doi.org/10.1016/j.jbusres.2021.10.054

Belderbos, R., Jacob, J., & Lokshin, B. (2018). Corporate venture capital (Corporate Venture Capital) investments and technological performance: Geographic diversity and the interplay with technology alliances. *Journal of Business Venturing*, *33*(1), 20–34. https://doi.org/10.1016/j.jbusvent.2017.10.003

Bendig, D., Kleine-Stegemann, L., Schulz, C., & Eckardt, D. (2022). The effect of green startup investments on incumbents' green innovation output. *Journal of Cleaner Production*, *376*. https://doi.org/10.1016/j.jclepro.2022.134316

Bergset, L., & Fichter, K. (2015). Green start-ups-a new typology for sustainable entrepreneurship and innovation research. *Journal of Innovation Management Bergset, Fichter JIM*, *3*, 118–144. http://www.open-jim.orghttp://creativecommons.org/licenses/by/3.0

Bertoni, F., Colombo, M. G., & Grilli, L. (2013). Venture capital investor type and the growth mode of new technology-based firms. *Small Business Economics*, *40*(3), 527–552. https://doi.org/10.1007/s11187-011-9385-9

Bertoni, F., Colombo, M. G., & Quas, A. (2015). PATTERNS OF VENTURE CAPITAL INVESTMENTS IN EUROPE. *Small Business Economics, Polimi*. www.vicoproject.org

Bertoni, F., Croce, A., & D'Adda, D. (2010). Venture capital investments and patenting activity of high-tech start-ups: A micro-econometric firm-level analysis. *Venture Capital*, *12*(4), 307–326. https://doi.org/10.1080/13691066.2010.486157

Bianchini, R., & Croce, A. (2022). The Role of Environmental Policies in Promoting Venture Capital Investments in Cleantech Companies. *Department of Management, Economics and Industrial Engineering, Politecnico Di Milano School of Management,*. https://doi.org/10.1561/114.00000024_app

Bigliardi, B., Ferraro, G., Filippelli, S., & Galati, F. (2020). The past, present and future of open innovation. In *European Journal of Innovation Management* (Vol. 24, Issue 4, pp. 1130–1161). Emerald Group Holdings Ltd. https://doi.org/10.1108/EJIM-10-2019-0296

Blum, D. A. (2015). Factors Contributing To Independent Venture Capital Successful Exits. In *Journal of Business & Economics Research-First Quarter* (Vol. 13, Issue 1).

Bocken, N. M. P. (2015). Sustainable venture capital - Catalyst for sustainable start-up success? *Journal of Cleaner Production*, *108*, 647–658. https://doi.org/10.1016/j.jclepro.2015.05.079

Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. In *Journal of Cleaner Production* (Vol. 65, pp. 42–56). https://doi.org/10.1016/j.jclepro.2013.11.039

Botta, & Kozluk. (2014). Botta and Koźluk - 2014 - Measuring Environmental Policy Stringency in OECD. *Organisation for Economic Co-Operation and Development*.

Chakrabarti, R., Henneberg, S. C., & Ivens, B. S. (2020). Open sustainability: Conceptualization and considerations. In *Industrial Marketing Management* (Vol. 89, pp. 528–534). Elsevier Inc. https://doi.org/10.1016/j.indmarman.2020.04.024

Chemmanur, T. J., Loutskina, E., & Tian, X. (2014). Corporate venture capital, value creation, and innovation. *Review of Financial Studies*, *27*(8), 2434–2473. https://doi.org/10.1093/rfs/hhu033

Chesbrough, H. (2012). Open innovation: Where we've been and where we're going. In *Research Technology Management* (Vol. 55, Issue 4, pp. 20–27). https://doi.org/10.5437/08956308X5504085

Ciulli, F., Kolk, A., Bidmon, C. M., Sprong, N., & Hekkert, M. P. (2022). Sustainable business model innovation and scaling through collaboration. *Environmental Innovation and Societal Transitions*, *45*, 289–301. https://doi.org/10.1016/j.eist.2022.11.003

Cojoianu, T. F., Clark, G. L., Hoepner, A. G. F., Veneri, P., & Wójcik, D. (2020). Entrepreneurs for a low carbon world: How environmental knowledge and policy shape the creation and financing of green start-ups. *Research Policy*, *49*(6). https://doi.org/10.1016/j.respol.2020.103988

Colombo, M. G., & Murtinu, S. (2015). Venture Capital Investments in Europe and Portfolio Firms' Economic Performance: Independent versus Corporate Investors. *Politecnico Di Milano, Department of Management, Economics and Industrial Engineering,*.

Cotei, C., & Farhat, J. (2019). The M&A Exit Outcome of High-Tech Startups. *Multinational Finance Society*.

Criscuolo, C., & Menon, C. (2015). Environmental policies and risk finance in the green sector: Cross-country evidence. *Energy Policy*, *83*, 38–56. https://doi.org/10.1016/j.enpol.2015.03.023

Cumming, D. J., Grilli, L., & Murtinu, S. (2017). Governmental and independent venture capital investments in Europe: a firm-level performance analysis. *Politecnico Di Milano, Department of Management, Economics and Industrial Engineering*,.

Cumming, D., Johan, S., & Nl, S. A. J. (2007). PRE-SEED Government Venture Capital FUNDS. *Journal of International Entrepreneurship, Forthcoming*. http://ssrn.com/abstract=1031005http://www.schulich.yorku.ca/http://Douglas.Cumming.com/http://ssrn.com/author=370203http://ssrn.com/abstract=1031005http://ssrn.com/abstract=1031005

Davila, A., Foster, G., & Gupta, M. (2000). Venture-Capital Financing and the Growth of Startup Firms. *GRADUATE SCHOOL OF BUSINESS STANFORD UNIVERSITY*.

De Lange, D., & Valliere, D. (2020). Sustainable firms and legitimacy: Corporate venture capital as an effective endorsement. *Journal of Small Business Management*, *58*(6), 1187–1220. https://doi.org/10.1080/00472778.2019.1681880

Demirel, P., Li, Q. C., Rentocchini, F., & Tamvada, J. P. (2019). Born to be green: new insights into the economics and management of green entrepreneurship. *Small Business Economics*, *52*(4), 759–771. https://doi.org/10.1007/s11187-017-9933-z

Díaz-Santamaría, C., & Bulchand-Gidumal, J. (2021). Econometric estimation of the factors that influence startup success. *Sustainability (Switzerland)*, *13*(4), 1–14. https://doi.org/10.3390/su13042242

DiVito, L., & Ingen-Housz, Z. (2021). From individual sustainability orientations to collective sustainability innovation and sustainable entrepreneurial ecosystems. *Small Business Economics*, *56*(3), 1057–1072. https://doi.org/10.1007/s11187-019-00254-6

Dushnitsky, G., & Lenox, M. J. (2005). When do incumbents learn from entrepreneurial ventures?: Corporate venture capital and investing firm innovation rates. *Research Policy*, *34*(5), 615–639. https://doi.org/10.1016/j.respol.2005.01.017

Dushnitsky, G., & Shapira, Z. (2010). Entrepreneurial finance meets organizational reality: Comparing investment practices and performance of corporate and independent venture capitalists. *Strategic Management Journal*, *31*(9), 990–1017. https://doi.org/10.1002/smj.851

Elaine Hollensbe, Gina Ness Greenhaus, Katherine Wookey, & Lakshmi S. Hajela. (2014). Foundations of organizing: Engaging extreme poor communities in business models for social and economic transformation. *Organization & Environment*, *27*(3), 213–240.

Elkington, J. (1998). Partnerships from cannibals with forks: The triple bottom line of 21st-century business. *Environmental Quality Management*, *8*(1), 37–51. https://doi.org/10.1002/tqem.3310080106

Ellili, N. O. D. (2022). Bibliometric analysis and systematic review of environmental, social, and governance disclosure papers: Current topics and recommendations for future research. *Environmental Research Communications*, *4*(9). https://doi.org/10.1088/2515-7620/ac8b67

Fan, X., & Zhang, S. (2016). Performance Evaluation for the Sustainable Supply Chain Management. In *Sustainable Supply Chain Management*. InTech. https://doi.org/10.5772/63065

Fauchart, E., & Gruber, M. (2011). Darwinians, communitarians, and missionaries: The role of founder identity in entrepreneurship. *Academy of Management Journal*, *54*(5), 935–957. https://doi.org/10.5465/amj.2009.0211

Fulghieri, P., & Sevilir, M. (2009). Organization and financing of innovation, and the choice between corporate and independent venture capital. *Journal of Financial and Quantitative Analysis*, *44*(6), 1291–1321. https://doi.org/10.1017/S0022109009990391

García-Benau, M. A., Sierra-Garcia, L., & Zorio, A. (2013). Financial crisis impact on sustainability reporting. *Management Decision*, *51*(7), 1528–1542. https://doi.org/10.1108/MD-03-2013-0102

Gompers, P., & Lerner, J. (2001). The Venture Capital Revolution. *Journal of Economic Perspectives—Volume 15, Number 2—Spring 2001—Pages 145–168*.

Greco, A., & De Jong, G. (2017). Sustainable entrepreneurship: definitions, themes and research gaps. *Centre for Sustainable Entrepreneurship University of Groningen/Campus Fryslân*. www.rug.nl/cf/cse

Groh, A., Liechtenstein, H., Lieser, K., & Biesinger, M. (2018). The Venture Capital and Private Equity Country Attractiveness Index 2018 Ninth Edition. *IESE Business School, University of Navarra*. http://blog.iese.edu/vcpeindex/

Guo, B., Lou, Y., & Pérez-Castrillo, D. (2015). Investment, Duration, and Exit Strategies for Corporate and Independent Venture Capital-Backed Start-Ups. *Journal of Economics and Management Strategy*, *24*(2), 415–455. https://doi.org/10.1111/jems.12097

Hadley, B. M. (2017). Analyzing VC Influence on Startup Success A people-centric network theory approach. *Department of Electrical Engineering and Computer Science in Partial Fulfillment of the Requirements , Massachusetts Institute of Technology*.

Hegeman, P. D., & Sørheim, R. (2021). Why do they do it? Corporate venture capital investments in cleantech startups. *Journal of Cleaner Production*, *294*. https://doi.org/10.1016/j.jclepro.2021.126315

Heughebaert, A. ;, & Manigart, S. (2012). Firm Valuation in venture capital financing rounds: the role of investor bargaining power. *Ghent University and Vlerick Leuven Gent Management School*. http://hdl.handle.net/20.500.12127/3941

Höchstädter, A. K., & Scheck, B. (2015). What's in a Name: An Analysis of Impact Investing Understandings by Academics and Practitioners. *Journal of Business Ethics*, *132*(2), 449–475. https://doi.org/10.1007/s10551-014-2327-0

Horne, J., & Fichter, K. (2022). Growing for sustainability: Enablers for the growth of impact startups – A conceptual framework, taxonomy, and systematic literature review. *Journal of Cleaner Production*, *349*. https://doi.org/10.1016/j.jclepro.2022.131163

Jaoui, F., Amoussou, O., & Kemeze, F. H. (2022). “Catch me if you can” on drivers of venture capital investment in Africa. *African Development Review*, *34*(S1), S117–S140. https://doi.org/10.1111/1467-8268.12655

Jeong, J., Kim, J., Son, H., & Nam, D. Il. (2020). The role of venture capital investment in startups’ sustainable growth and performance: Focusing on absorptive capacity and venture capitalists’ reputation. *Sustainability (Switzerland)*, *12*(8). https://doi.org/10.3390/SU12083447

Johansson, J., Malmström, M., & Wincent, J. (2021). Sustainable Investments in Responsible SMEs: That’s What’s Distinguish Government VCs from Private VCs. *Journal of Risk and Financial Management*, *14*(1), 25. https://doi.org/10.3390/jrfm14010025

Johnson, M. , S. A. , W. L. (2022). Resilience in Sustainable Startups: Navigating Uncertainty and Building a Better Future. *Journal of Sustainable Entrepreneurship*.

Kimpimäki, J. P., Malacina, I., & Lähdeaho, O. (2022). Open and sustainable: An emerging frontier in innovation management? *Technological Forecasting and Social Change*, *174*. https://doi.org/10.1016/j.techfore.2021.121229

Kirby, M. (2011). The history, achievement and future of the 1980 OECD guidelines on privacy. *International Data Privacy Law*, *Oxford University Press*. https://academic.oup.com/idpl/article/1/1/6/759637

Kruse, T., Dechezleprêtre, A., Saffar, R., & Robert, L. (2022). Measuring environmental policy stringency in OECD countries: An update of the OECD composite EPS indicator. *OECD Economics Department Working Papers*. https://doi.org/10.1787/90ab82e8-en

Lee, P. M., Pollock, T. G., & Jin, K. (2011). The contingent value of venture capitalist reputation. *Strategic Organization*, *9*(1), 33–69. https://doi.org/10.1177/1476127011400505

Lee, S., Park, G., Yoon, B., & Park, J. (2010). Open innovation in SMEs-An intermediated network model. *Research Policy*, *39*(2), 290–300. https://doi.org/10.1016/j.respol.2009.12.009

Lee, W., & Kim, B. (2019). Business sustainability of start-ups based on government support: An empirical study of Korean start-ups. *Sustainability (Switzerland)*, *11*(18). https://doi.org/10.3390/su11184851

Leimgruber, M., & Schmelzer, M. (2017). From the marshall plan to global governance: Historical transformations of the OEEC/OECD, 1948 to Present. In *The OECD and the International Political Economy Since 1948* (pp. 23–61). Springer International Publishing. https://doi.org/10.1007/978-3-319-60243-1_2

Lin, L. (2022). Venture Capital in the Rise of Sustainable Investment. *European Business Organization Law Review*, *23*(1), 187–216. https://doi.org/10.1007/s40804-021-00238-8

LiPuma, J. A. (2006). Independent venture capital, corporate venture capital, and the internationalisation intensity of technology-based portfolio firms. In *International Entrepreneurship and Management Journal* (Vol. 2, Issue 2, pp. 245–260). https://doi.org/10.1007/s11365-006-8687-x

Luukkonen, T., Deschryvere, M., & Bertoni, F. (2013). The value added by government venture capital funds compared with independent venture capital funds. *Technovation*, *33*(4–5), 154–162. https://doi.org/10.1016/j.technovation.2012.11.007

Martin, J.-F. (2014). *Sustainability's strategic worth, McKinsey Global Survey results*.

Martin, R. L., & Osberg, S. (2007). Social Entrepreneurship: The Case for Definition. *Stanford Social Innovation Review*. www.ssireview.org

Maula, M. (2005). Corporate Venture CapitalISTS AND Independent Venture CapitalISTS: WHAT DO THEY KNOW, WHO DO THEY KNOW, AND SHOULD ENTREPRENEURS CARE? *Helsinki University of Technology, London Business School*.

Maula, M., & Murray, G. (2001). Complementary value-adding roles of corporate venture capital and independent venture capital investors Evaluation of the Swedish Regional Co-investment Funds (CIFs) View project New ventures internationalization View project. *Helsinki University of Technology Institute of Strategy and International Business*. https://www.researchgate.net/publication/228906507

Miller, P., & Bound, K. (2011). The Startup Factories The rise of accelerator programmes to support new technology ventures. *NESTA, Making Innovation Flourish*. www.nesta.org.uk

Morgan, J. P., Research, G., O'donohoe, N., Leijonhufvud, C., Saltuk, Y., Bugg-Levine, A., & Brandenburg, M. (2010). Impact Investments: An emerging asset class. *Global Research Rockefeller Foundation*.

Mrkajic, B., Murtinu, S., & Scalera, V. G. (2019). Is green the new gold? Venture capital and green entrepreneurship. *Small Business Economics*, *52*(4), 929–950. https://doi.org/10.1007/s11187-017-9943-x

Munari, F., & Toschi, L. (2015). Do patents affect VC financing? Empirical evidence from the nanotechnology sector. *International Entrepreneurship and Management Journal*, *11*(3), 623–644. https://doi.org/10.1007/s11365-013-0295-y

Muñoz, P., & Cohen, B. (2018). Sustainable Entrepreneurship Research: Taking Stock and looking ahead. *Business Strategy and the Environment*, *27*(3), 300–322. https://doi.org/10.1002/bse.2000

Murray, G. (1999). Early-stage venture capital funds, scale economies and public support. *Venture Capital*, *1*(4), 351–384. https://doi.org/10.1080/136910699295857

Murray, G. C. (2007). Venture capital and government policy. In *Handbook Of Research On Venture Capital* (pp. 113–151). Edward Elgar Publishing. https://doi.org/10.4337/9781847208781.00011

Nanda, R., & Rhodes-Kropf, M. (2013). Investment cycles and startup innovation. *Journal of Financial Economics*, *110*(2), 403–418. https://doi.org/10.1016/j.jfineco.2013.07.001

Nidumolu, R., Prahalad, C. K., & Rangaswami, M. R. (2009). Why Sustainability Is Now the Key Driver of Innovation. In *Harvard Business Review*.

Nielsen. (2016). *THE SUSTAINABILITY IMPERATIVE INSIGHTS ON CONSUMER EXPECTATIONS*.

Nunes, A. K. da S., Morioka, S. N., & Bolis, I. (2022). Challenges of business models for sustainability in startups. *RAUSP Management Journal*, *57*(4), 382–400. https://doi.org/10.1108/RAUSP-10-2021-0216

Ooghe, H., Bekaert, A., & Van Den Bossche, P. (1989). Venture Capital in the U.S.A., Europe and Japan. In *Source: Management International Review* (Vol. 29, Issue 1).

Panapanaan, V. M., & Linnanen, L. (2002). Management of Corporate Responsibility Towards Sustainability: Triple Bottom Line Approach. *Sustainability, Corporations and Institutional Arrangements*.

Phills, J. (2009). Rediscovering Social Innovation. *Stanford Graduate School of Business, The Fieldstone Foundation San Diego Grantmakers*.

Polzin, F. (2017). Mobilizing private finance for low-carbon innovation – A systematic review of barriers and solutions. In *Renewable and Sustainable Energy Reviews* (Vol. 77, pp. 525–535). Elsevier Ltd. https://doi.org/10.1016/j.rser.2017.04.007

Preston, M., McGill, A., Kerr, J., Retana, J., & Ambler, M. (2013). Measuring and managing total impact: A new language for business decisions. *PWC*.

Rauter, R., Globocnik, D., Perl-Vorbach, E., & Baumgartner, R. J. (2019). Open innovation and its effects on economic and sustainability innovation performance. *Journal of Innovation and Knowledge*, *4*(4), 226–233. https://doi.org/10.1016/j.jik.2018.03.004

Roberts, J. A., & KLostert, J. (2018). Towards policy coherence for the Sustainable Development Goals: How can impact investing support integrated policy-making? *OECD Development Co-Operation Working Papers*, *47*.

Rossi, M., Festa, G., Papa, A., Kolte, A., & Piccolo, R. (2020). Knowledge management behaviors in venture capital crossroads: a comparison between Independent Venture Capital and Corporate Venture Capital ambidexterity. *Journal of Knowledge Management*, *24*(10), 2431–2454. https://doi.org/10.1108/JKM-05-2020-0328

Rudolph, H. P., & Miguel, F. (2023). Venture Capital in Latin America and the Caribbean. *International Bank for Reconstruction and Development / The World Bank*. www.worldbank.org

Schaltegger, S., Hansen, E. G., & Lüdeke-Freund, F. (2016). Business Models for Sustainability: Origins, Present Research, and Future Avenues. In *Organization and Environment* (Vol. 29, Issue 1, pp. 3–10). SAGE Publications Inc. https://doi.org/10.1177/1086026615599806

Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2012). Business cases for sustainability: The role of business model innovation for corporate sustainability. *International Journal of Innovation and Sustainable Development*, *6*(2), 95–119. https://doi.org/10.1504/IJISD.2012.046944

Schlange, L. E., & Schlange Professor of Business Administration, L. E. (n.d.). *ABEAI 2006 What drives Sustainable Entrepreneurs ? "WHAT DRIVES SUSTAINABLE ENTREPRENEURS?" Topic area #9: Entrepreneurship and Small Business Management*.

Shuwaikh, F., Brintte, S., Khemiri, S., & Castro, R. G. De. (2022). Venture capital activities under uncertainty: US and UK investors behavior. *Annals of Operations Research*. https://doi.org/10.1007/s10479-022-04962-3

Spigel, B. (2017). The Relational Organization of Entrepreneurial Ecosystems. *Entrepreneurship: Theory and Practice*, *41*(1), 49–72. https://doi.org/10.1111/etap.12167

Terjesen, S., Bosma, N., & Stam, E. (2016). Advancing Public Policy for High-Growth, Female, and Social Entrepreneurs. *Public Administration Review*, *76*(2), 230–239. https://doi.org/10.1111/puar.12472

Tiba, S., van Rijnsoever, F. J., & Hekkert, M. P. (2021). Sustainability startups and where to find them: Investigating the share of sustainability startups across entrepreneurial ecosystems and the causal drivers of differences. *Journal of Cleaner Production*, *306*. https://doi.org/10.1016/j.jclepro.2021.127054

Wagner, M. (2009). Eco-entrepreneurship: An empirical perspective based on survey data. *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth*, *20*, 127–152. https://doi.org/10.1108/S1048-4736(2009)0000020009

West, J., & Bogers, M. (2014). Leveraging External Sources of Innovation: A Review of Research on Open Innovation. *Product Development & Management Association*. http://ssrn.com/abstract=2195675

West, J., Salter, A., Vanhaverbeke, W., & Chesbrough, H. (2014). Open innovation: The next decade. In *Research Policy* (Vol. 43, Issue 5, pp. 805–811). Elsevier B.V. https://doi.org/10.1016/j.respol.2014.03.001

Westley, F., & Antadze, N. (2010). Making a difference: Strategies for scaling social innovation for greater impact. *The Innovation Journal*, *15*(2), 1–19.

Whelan, T., & Fink, C. (2016). The Comprehensive Business Case for Sustainability. *Harvard Business Review*.

Wiedemann, C., & Ahmed Youssef. (2017). Access to finance for sustainable enterprises - Rethinking established credit policies of banks and investors. *Journal of Sustainable Finance & Investment*, *7*(1)

Wolfe, R. (2007). From reconstructing Europe to constructing globalization: the OECD in historical perspective. *School of Policy Studies Queen's University*. https://www.researchgate.net/publication/228424673

Zhou, H., Sandner, P. G., Martinelli, S. L., & Block, J. H. (2016). Patents, trademarks, and their complementarity in venture capital funding. *Technovation*, *47*, 14–22. https://doi.org/10.1016/j.technovation.2015.11.005